

## Determining Company Strategy Priorities at PT X In Efforts to Increase Productivity Performance

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### ABSTRACT

White crystal sugar is a strategic commodity within Indonesia's national food security system, with consumption steadily increasing across both household and industrial sectors. However, domestic production has not kept pace with demand, resulting in supply deficits that generate import dependence, price volatility, and structural vulnerability within the sugar industry. Challenges in the downstream sector further hinder national food security. The sugar industry's supply chain faces persistent inefficiencies in distribution, price instability, trader dominance, and limited logistics infrastructure. A key issue lies in low factory productivity stemming from operational inefficiencies. Government policies, including Minister of Industry Regulation No. 47/2024, require strong stakeholder support, particularly from PT X, a state-owned agroindustry subsidiary. This study identifies strategies for PT X to improve productivity and optimize resource utilization in its sugar factories. Using an integrated Delphi-DEMATEL-ANP approach, the analysis identified seven priority strategies, with two ranking highest in the supermatrix limit, followed by milling process optimization, production-marketing coordination, internal distribution system enhancement, facility layout planning, and machine maintenance and re-layout. Sensitivity tests conducted at weight variations of 5%, 10%, 20%, and 30% confirmed the stability of strategy rankings, demonstrating robustness and systematic consistency. The findings highlight that the most adaptive and applicable productivity improvement strategy for PT X is one that strengthens its overall operational foundation. This approach has the potential to enhance internal efficiency while increasing the company's contribution to achieving national sugar self-sufficiency.

*Keywords: white crystal sugar, sugar factory, sugar self-sufficiency, production revitalization, strategic management.*

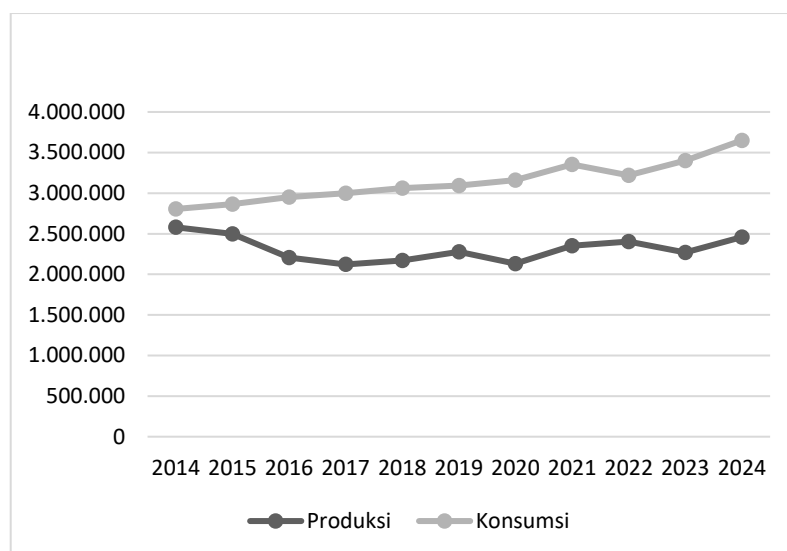
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### INTRODUCTION

Sugar is one of the food commodities categorized as a basic necessity in Indonesia. White crystal sugar is the most widely consumed type, used daily by households as well as in the food and beverage industry (Adalı & Işık, 2016; Živković et al., 2015). The role of white crystal sugar extends beyond its function as a sweetener—it is also a strategic commodity within the national food security system and a key component in maintaining economic stability. This is affirmed in the Presidential Regulation of the Republic of Indonesia Number 71 of 2015 concerning the Determination and Storage of Basic Necessities and Essential Goods, which stipulates that the Central and Regional Governments are obligated to ensure the availability of white crystal sugar in sufficient quantities and at prices affordable to the public.

As one of the nation's basic commodities, the level of public dependence on white crystal sugar remains relatively high. Demand continues to increase in line with population growth, rising per capita income, and the expansion of the food and beverage processing industry, which relies directly on sugar as a primary raw material (Bhatti, 2024; Kuo et al., 2022; Salehi et al., 2021). This growth in consumption illustrates that white crystal sugar is not only essential for household use but also plays a vital role in the national industrial sector. To reinforce this point, a comparative projection of national white crystal sugar consumption and production data from 2014 to 2024 is presented below (Kusuma et al., 2024; Hartanto, 2014).



**Figure 1. Data on the Production and Consumption of White Crystal Sugar in Indonesia**

Source: (Ministry of Agriculture, 2023) (Reprocessed)

Based on national sugar production and consumption data shown in Figure 1, there is a consistent increasing trend in white crystal sugar consumption from year to year. In 2014, national sugar consumption was recorded at 2,805,000 tons and continued to rise gradually, reaching 3,650,000 tons in 2024. This increase reflects the steady growth in both public and industrial demand for sugar, aligned with population growth, rising income levels, and the expansion of the food and beverage sector. In contrast, national sugar production has remained stagnant, showing a long-term downward trend. In 2014, sugar production stood at 2,579,173 tons but fell sharply to 2,121,671 tons in 2017. Although production increased in subsequent years, such as 2021 and 2022, the trend has not been stable. By 2023, production decreased again to 2,271,000 tons, with only a slight rise to 2,460,000 tons in 2024.

This significant gap between production volume and national consumption demonstrates that domestic production cannot meet national demand, resulting in a supply deficit (shortage). This imbalance between demand and supply can seriously affect price stability, import dependency, and the long-term sustainability of the national sugar industry (Ginting, 2025; Saragih, 2017; Sinuraya et al., 2024). Such challenges strongly indicate that Indonesia's sugar industry is facing complex structural issues.

Problems in the downstream sector of Indonesia's sugar industry represent one of the major constraints hindering national food security, particularly regarding the white crystal sugar commodity. Although sugarcane is cultivated across various regions, the processing and distribution capabilities of the sugar industry still face multiple structural challenges (Firmansyah et al., 2021; Syahfitri et al., 2022). The downstream sugar mill supply chain continues to struggle with inefficient distribution, fluctuating prices, market dominance by large traders, and limited logistics infrastructure, such as warehouses and integrated transportation systems. One of the main concerns is the inability of sugar mills to operate efficiently, resulting in low productivity. Many existing sugar mills are outdated, rely on obsolete technology, and operate with poor efficiency levels (Mayangsari & Al Fauzi, 2023; Supriyati, 2024). The resulting low yield contributes to high production costs and reduces the competitiveness of domestic products. Furthermore, the lack of integrated distribution and

logistics systems worsens the condition, as imbalances between production sites and consumption centers lead to high transportation costs.

This irregularity not only disadvantages domestic producers but also risks creating market distortions that ultimately harm consumers. Therefore, an in-depth study of the dynamics within the downstream sugar industry is needed to formulate appropriate and sustainable strategies for productivity improvement. Without comprehensive and continuous efforts, achieving national self-sufficiency in sugar production will remain a major challenge in developing the country's food security sector. Strengthening domestic production capacity in every sugar factory across Indonesia is essential to ensuring national resilience in white crystal sugar. The issues facing the sugar industry require both government and industry players to maintain effective and sustainable supply chain management and trading systems for white crystal sugar.

The synergy between government policies and adaptive industrial strategies is key to ensuring sustainable white crystal sugar production that meets national needs and stabilizes prices. In response, the government issued Permenperin No. 47 of 2024 to guarantee the availability of sugarcane as a raw material and to strengthen planning for the domestic sugar industry's production requirements. One of the key stakeholders is PT X, a state-owned enterprise in the agro-industrial sector that operates two sugar factories in East Java. During its 2020–2024 Strategic Plan, PT X has focused on improving efficiency and productivity but continues to face challenges such as limited quality raw materials, outdated machinery, uneven technological modernization, and suboptimal distribution and logistics systems.

These factors have led to high production costs and reduced competitiveness. This study focuses on the factory-level operations of PT X, aiming to identify internal challenges, opportunities for improvement, and formulate a comprehensive productivity enhancement strategy covering technical, managerial, process, distribution, and product competitiveness aspects. The success of such a strategy depends not only on careful planning but also on strong collaboration among stakeholders. The research adopts a participatory approach, applying the Delphi method to gather stakeholder perceptions, DEMATEL to map cause-and-effect relationships among strategic factors, and ANP to determine the most influential strategic priorities. The study was conducted at PT X's Board of Directors Office in Surabaya and its two factory units in Malang and Kediri. The results are expected to generate an adaptive and applicable strategic plan to enhance productivity, strengthen PT X's position within the sugarcane agroindustry sector, and provide a pilot model for operational improvement strategies in sugar mills.

## **METHOD**

This chapter outlines the stages of the research. Research methodology generally consists of several stages, namely an overview of the research object, organizational structure, research systematics, data collection, research methods, expected results, and research schedule.

### **Overview of Research Objects**

PT X is a subsidiary of State-Owned Enterprises (SOEs) engaged in the agroindustry sector, especially in the field of white crystal sugar production. The legality of its establishment was affirmed through Notary Deed No. 93 dated August 28, 1996, which was strengthened by the South Jakarta District Court Determination Letter and ratification by the Ministry of Law and

Human Rights through Decree Number C2-9513. HT.01.04.TH.96 dated October 15, 1996. PT X has a Board of Directors Office in Surabaya as well as a sugar factory located in Malang Regency and Kediri City, East Java Province, an area with high sugarcane agribusiness potential and one of the national sugar production centers. Here's the location points on Google Maps.



**Figure 2. PT X Board of Directors Office in Surabaya City**  
Source: Google Maps (2025), reprocessed for research purposes



**Figure 3. Location of PT X Sugar Factory in Malang Regency**  
Source: Google Maps (2025), reprocessed for research purposes



**Figure 4. Location of PT X Sugar Factory in Kediri City**  
Source: Google Maps (2025), reprocessed for research purposes

In Figures 2 to 4, which depict the location of the Board of Directors Office in Surabaya as well as the sugar factories located in Malang Regency and Kediri City, East Java Province, PT X’s strategic commitment to facing industrial dynamics is reflected in its vision and mission, which serve as the foundation for policy formulation and operational direction. PT X’s vision is “to become the best company in the field of agroindustry, capable of facing challenges and excelling in national competition.” This vision reflects the company’s aspiration not merely to survive in market competition but to emerge as a strong and innovative leader in Indonesia’s agro-industry sector. To realize this vision, PT X carries out the mission “to be a company with the best performance in the agroindustry sector, managed professionally and innovatively, oriented toward product quality, and capable of growing and developing to meet stakeholder expectations.” This mission demonstrates PT X’s commitment to quality, professionalism, sustainable growth, and accountability toward both internal and external stakeholders.

In response to efficiency challenges, fluctuations in global sugar prices, and increasingly competitive market demands, PT X continues to pursue comprehensive transformation. Supported by a strong legal foundation, institutional backing from its parent state-owned enterprise (SOE), and an innovative culture embedded within the organization, PT X is well-positioned to contribute significantly to achieving national sugar industry independence. As a company that upholds the principles of Good Corporate Governance (GCG), PT X maintains an integrated and adaptive organizational structure designed to respond effectively to evolving challenges. Its management functions encompass production, finance and business development, technology, human resources, procurement, quality and innovation, and internal supervision—all working synergistically to enhance operational effectiveness and efficiency.

The research data were obtained through a combination of primary and secondary sources. Primary data were collected through Focus Group Discussions (FGD) and surveys conducted with PT X stakeholders, while secondary data were gathered from internal company documents and official government publications. These data formed the basis for subsequent identification and analytical processes. The research was conducted from April to December 2025 at the PT X Board of Directors Office in Surabaya and its two sugar production units

located in Malang Regency and Kediri City, East Java Province, which operate as state-owned subsidiaries in the sugarcane agroindustry sector.

The research approach used was quantitative, employing a combination of the Delphi, DEMATEL (Decision Making Trial and Evaluation Laboratory), and Analytic Network Process (ANP) methods. The Delphi method was utilized to systematically and independently collect expert opinions, facilitating the extraction of collective knowledge from sugar industry specialists, PT X managers, and relevant academics. Its iterative process allows for the refinement of responses and the achievement of consensus without social pressure, resulting in a credible and representative list of strategic factors. The DEMATEL method was applied to map cause-and-effect relationships among strategies, while the ANP method was used to determine priority strategies with the strongest impact. The integration of these three methods enables the formulation of a comprehensive, data-driven strategic plan to enhance PT X's production productivity while strengthening its long-term contribution to achieving national sugar self-sufficiency. The selection of this integrated approach reflects the need to analyze complex and interrelated issues to produce realistic and implementable strategic priorities.

## **RESULTS AND DISCUSSION**

After obtaining the final strategic priorities through the Analytic Network Process (ANP)—which involves constructing the network structure, performing pairwise comparison assessments, forming a supermatrix, and converting it into a limit supermatrix—a ranking of strategies was produced that reflects the relative contribution of each alternative to the goal of increasing PT X's productivity. This analysis captures the interdependence between factors from both internal and external perspectives.

However, the strategic decisions resulting from the ANP must be tested for stability. In managerial practice, the weighting of assessment criteria can fluctuate due to operational dynamics, government policies, market changes, or expert preferences. Therefore, further analysis in the form of a sensitivity test is necessary to ensure that small or moderate changes in criterion weights do not significantly alter the ranking of strategic priorities.

In this study, the sensitivity test was conducted in stages, applying weight variations of 5%, 10%, 20%, and 30%. This range was selected to represent three conditions: mild changes (5%), moderate changes (10%–20%), and extreme but still realistic changes (30%). Through this approach, it can be determined whether the resulting strategic priorities are robust, consistent, and reliable under various assumption scenarios. Additionally, sensitivity testing makes it possible to identify which strategies are most vulnerable or stable to weighting changes, providing a stronger foundation for management decision-making.

Accordingly, the following subsection presents the complete results of the 5%–30% ANP sensitivity tests, including variations in priority values, sensitivity graphs, and the interpretation of their impact on the sequence of PT X's productivity improvement strategies.

### **Hasil Sensitivity 5%**

The results of the sensitivity test with a 5% increase in weight showed that all factors in the ANP model underwent priority value adjustments, but the change was very small and did not cause a significant shift in the ranking structure. Overall, the pattern that emerged indicated

that the priority model produced under the original weight condition had a high level of stability. The following is a table of the 5% Sensitivity Test Results.

**Table 1. Sensitivity Test Results Table 5%**

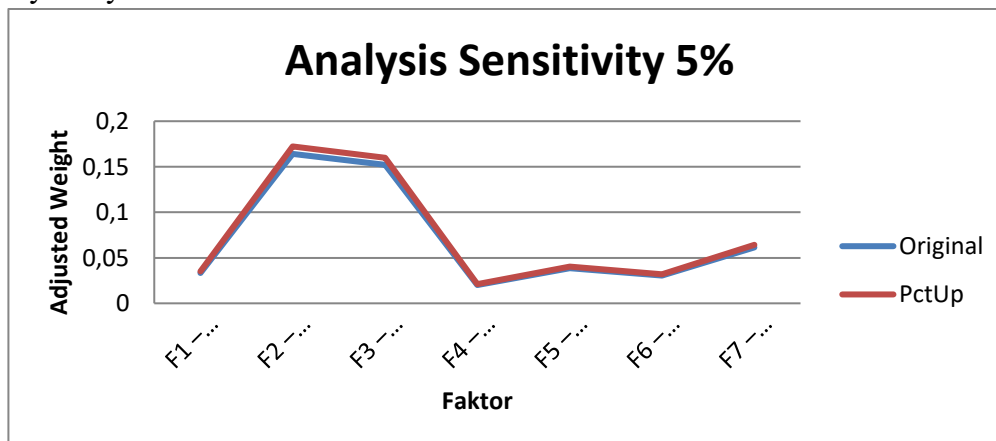
Factor	Original	PctUp	Scale	Adjusted
F1 – Internal Distribution System Optimization	0,033462	0,035135	0,998269	0,033404
F2 – Digitize Distribution Tracking	0,16409	0,172295	0,990185	0,162479
F3 – Optimization of Raw Material Governance	0,152171	0,15978	0,991026	0,150805
F4 – Perawatan & Re-layout Mesin Existing	0,020093	0,021098	0,998975	0,020072
F5 – Production Coordination–Internal Marketing	0,038485	0,040409	0,997999	0,038408
F6 – Warehouse Layout Arrangement & Goods Flow	0,030426	0,031947	0,998431	0,030378
F7 – Milling Process Efficiency	0,061273	0,064337	0,996736	0,061073

Source: Processed primary data (2025)

In tables 1, the F2 factor of Distribution Tracking Digitization, which from the beginning had the largest weight in its group, increased from 0.16409 to 0.172295 (in the PctUp column). However, after adjusting the scale through the normalization process, the adjusted value returned to the range of 0.162479. This confirms that even though weight changes are applied, the relative dominance of this factor remains consistent and does not change significantly.

The F3 factor of Optimizing Raw Material Governance also shows a similar pattern. The initial value of 0.152171 increased to 0.15978 before normalization, and then settled at an adjusted value of 0.150805. This relatively small difference reinforces the finding that the sensitivity of factors to weight changes is very low.

Other factors, such as F1 Internal Distribution System Optimization, F4 Maintenance & Re-layout of Existing Machines, F5 Production–Internal Marketing Coordination, F6 Warehouse Layout Arrangement, and F7 Milling Process Efficiency, also show an almost identical pattern of change: the PctUp value increases slightly according to the weight increase scenario, but the adjusted value returns to the original value with a very small deviation. For example, F1 goes from 0.033462 to 0.035135 and back to 0.033404, while F7 goes up from 0.061273 to 0.064337 and back to 0.061073. The following is a graph of the results of the 5% sensitivity analysis.



**Figure 5. Graph of Sensitivity Analysis Results 5%**

Source: Processed primary data (2025)

Figure 5 presents the graph of the 5% sensitivity analysis results. Once the 5% sensitivity table showed that weight changes produced only minor adjustments for each factor, a graphical visualization was developed to illustrate the pattern of these variations. This graph compares the original weight value with the PctUp value after a 5% weight increase, thereby presenting a more intuitive view of the stability level for each factor. The visual representation indicates that all factors demonstrate nearly intersecting lines between pre- and post-weight increments, reaffirming that a 5% change has no significant impact on the ANP priority structure.

From these results, it can be concluded that the ANP model has high stability at a 5% weight change rate, as none of the factors show substantial deviations or alterations in priority order. Therefore, the obtained ANP results can be considered robust under minor change scenarios, making them reliable for use as a foundation for strategic decision-making at PT X.

### **Conclusion of Sensitivity Test Results**

The overall results of the sensitivity tests, conducted at weight change variations of 5%, 10%, 20%, and 30%, indicate that the ANP model used in this study exhibits exceptional robustness and stability. Across all scenarios, factor values change proportionally with weight adjustments; however, none of the changes alter the relative priority ranking between factors. The F2 factor—Digitization of Distribution Tracking—consistently shows the highest value and sensitivity level across all scenarios while maintaining its position as the most dominant factor after normalization. Similarly, F3—Raw Material Governance Optimization—remains in second place and responds proportionally to weight increases without disrupting the model's priority structure. Intermediate factors such as F7—Milling Process Efficiency—display moderate changes that do not affect the ranking of core factors. Meanwhile, low-weight factors (F1, F4, F5, and F6) exhibit minimal deviations, reflecting low sensitivity and strong stability against weight variations.

The progression from 5% to 30% change demonstrates a linear and controlled relationship: as weight increases, the PctUp value rises correspondingly, but normalization consistently returns the adjusted values near their initial positions. This confirms that the network structure among factors in the ANP model is well-formed and resilient to changes in weighting assumptions, even under extreme variations (30%). Such consistency provides empirical evidence that the ANP priority results are not only valid under initial conditions but also resistant to uncertainty and expert perception fluctuations. Hence, these findings can confidently be used as a reliable basis for strategic decision-making at PT X. Overall, the entire sensitivity analysis confirms that the strategies prioritized in the ANP model can be implemented with high confidence, as they remain stable across multiple weight-change scenarios.

### **Integration of Research with PT X's Conditions**

This research is highly integrated with the actual conditions at PT X, a state-owned subsidiary that manages two sugar factories in Malang and Kediri. PT X faces multiple operational challenges, including outdated machinery, inefficient technology, limited quality raw materials, low yield, distribution inefficiencies, and weak competitiveness. The focus of this study is at the factory level to ensure that the formulated strategies are relevant and

applicable. Internal stakeholders were involved through the Delphi method, ensuring that the strategic factors analyzed accurately represent real challenges in the field.

The Delphi results were subsequently analyzed using DEMATEL to map cause-and-effect relationships between factors, identify primary driving factors such as process efficiency, raw material quality, and technology, and differentiate them from impact factors. The ANP method was then employed to establish strategic priorities by considering technical, managerial, and logistical aspects. This integration ensures that the resulting strategies are actionable across short-, medium-, and long-term planning horizons.

The formulated strategies not only aim to increase internal factory productivity but also support national sugar self-sufficiency by improving efficiency, yield, raw material quality, and reducing production costs per unit. However, these recommendations remain conceptual and adaptable, depending on PT X's internal policies and capacity. Management must adjust implementation according to prevailing operational conditions and regulatory frameworks to effectively strengthen factory performance and PT X's contribution to national sugar availability.

### **PT X Strategy Priority Ranking (Delphi + DEMATEL + ANP Integration Results)**

This research aims to formulate a strategy to increase PT X's productivity to support national sugar self-sufficiency. Using the Delphi, DEMATEL, and ANP methods, the research identified strategic factors and mapped the cause-and-effect relationships between factors, then prioritized strategies based on their impact on productivity. PT X's strategic priorities are: 1) digitization of distribution tracking, 2) optimization of raw material governance, 3) milling process efficiency, 4) internal production–marketing coordination, 5) optimization of internal distribution system, 6) arrangement of warehouse layout & flow of goods, and 7) maintenance & re-layout of existing machines. Distribution digitalization aims to increase stock visibility, accelerate sugar flow, lower costs, and stabilize prices. Optimization of raw materials focuses on the quality and continuity of sugarcane supply through partnerships, plantation mapping technology, digitization of receipts, and farmer coaching, so that yields increase and national production increases. Milling process efficiency targets bottlenecks and losses through milling parameter optimization, real-time monitoring, and continuous improvement to increase yield. Production–marketing coordination ensures production according to market demand, prevents overproduction or understock, and supports price stability. Optimization of internal distribution and arrangement of warehouse layouts improves the efficiency of the flow of goods, reduces costs, and accelerates the availability of sugar in the market. Machine maintenance and re-layout maintain continuity of operation, minimize downtime, and guarantee plant readiness throughout the milling season. Overall, these strategies are systematic, measurable, and focus on the main leverage factors to increase PT X's productivity.

### **CONCLUSION**

This research aims to formulate a strategy to increase PT X's productivity to support national sugar self-sufficiency. Using the Delphi, DEMATEL, and ANP methods, the research identified strategic factors and mapped the cause-and-effect relationships between factors, then prioritized strategies based on their impact on productivity. PT X's strategic priorities are: 1) digitization of distribution tracking, 2) optimization of raw material governance, 3) milling

process efficiency, 4) internal production–marketing coordination, 5) optimization of internal distribution system, 6) arrangement of warehouse layout & flow of goods, and 7) maintenance & re-layout of existing machines. The digitization of distribution tracking aims to enhance stock visibility, accelerate the flow of sugar, reduce logistics costs, and stabilize prices. The optimization of raw materials focuses on improving the quality and continuity of sugarcane supply through partnerships, plantation mapping technology, receipt digitization, and farmer training programs, thereby increasing yield and national production. Milling process efficiency addresses bottlenecks and losses through parameter optimization, real-time monitoring, and continuous improvement to boost yield. Production–marketing coordination ensures alignment between production and market demand, preventing overproduction or shortages and promoting price stability. The optimization of internal distribution and warehouse layout improves the efficiency of goods movement, reduces operational costs, and accelerates sugar availability in the market. Finally, machine maintenance and re-layout ensure operational continuity, minimize downtime, and maintain plant readiness throughout the milling season. Overall, these strategies are systematic, measurable, and focused on the primary leverage factors that drive PT X’s productivity improvement.

Based on the integrated results of the Delphi, DEMATEL, and ANP methods, this study successfully developed adaptive, applicable, and potentially high-impact strategic priorities for improving PT X’s sugar factory productivity. These include enhancements in asset management and the strengthening of human resources. The strategy priorities were derived after mathematically calculating all interdependencies to a steady-state condition, ensuring that the final weighting reflects the most stable influence within PT X’s production system. The findings indicate that the most adaptive strategic plan for PT X is not solely one that directly increases production output but one that reinforces the foundational aspects of the operational system as a whole. With proper implementation, these prioritized strategies will not only enhance PT X’s internal efficiency but also strengthen the company’s contribution to achieving the national objective of sugar self-sufficiency through increased productivity.

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