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UPSTREAM SUPPLY CHAIN PERFORMANCE EFFICIENCY: CASE STUDY OF CREATOR COFFEE ROASTER IN YOGYAKARTA

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ABSTRACT

The Creator Coffee Roaster is a speciality coffee processing business based in Yogyakarta and has been established since 2012. The company focuses on producing roasted coffee beans of various types, including Robusta, Arabica, and house blends that are uniquely crafted by the company. The raw coffee beans are sourced from multiple coffee-producing regions in Indonesia, giving their products a diverse richness of flavour. As consumer interest in speciality coffee continues to grow, the demand for The Creator Coffee Roaster's products has also increased steadily. This study evaluates the efficiency of the supply chain using the Data Envelopment Analysis (DEA) method, with input variables such as cash-to-cash cycle time and order fulfilment cycle time, and output variables such as delivery performance and order fulfilment. The analysis results show that farmers 2 and 4 achieved 100% efficiency, while farmers 1 and 3 were still inefficient, with scores of 57.1% and 66.7%, respectively. The novelty of this research lies in utilising DEA, which adopts input and output variables from the SCOR 12.0 method to provide a data-driven evaluation, helping speciality coffee roastery SMEs optimise their supply chain strategy. Based on these findings, it is recommended that specialty coffee SMEs establish partnerships with efficient farmers, provide improvement feedback to those who are less efficient, and adopt data-driven supply chain management to enhance competitiveness and business sustainability.

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INTRODUCTION

The coffee industry in Indonesia has a long history, starting during the Dutch colonial period in the 17th century (Taqiyuddin et al., 2023). Today, Indonesia is known as one of the largest coffee producers in the world, with major production areas such as Sumatra, Java, Sulawesi, and Bali (Pratiwi, 2016). Coffee produced in

Indonesia has distinctive characteristics with a rich taste and complex aroma (Azizah et al., 2019). The main varieties grown are Arabica and Robusta, while luwak coffee is one of the most famous and expensive coffee products globally (Yulia et al., 2016).

Indonesia is one of the largest coffee producers in the world, known for its diverse varieties and unique flavours from various regions such as Aceh, Gayo, Toraja, and Flores. The Indonesian coffee industry holds significant potential, not only in the domestic market but also internationally, especially in the increasingly popular speciality coffee segment. However, speciality coffee SMEs face various challenges, including maintaining consistent quality, ensuring a smooth supply of raw materials from local farmers, and addressing issues such as high logistics costs and supply chain inefficiencies (Prahita et al., 2023; Kamble et al., 2020). Additionally, increasing market competition, consumer demands for production process transparency, and the need to adapt to modern technology add further pressure for SMEs to grow and remain relevant continuously (Thiruchelvam, 2018; Azis & Irjayanti, 2023)

The coffee industry in Indonesia not only has economic impacts but also significant social effects, as thousands of small farmers rely on coffee as their livelihood (Sarirahayu & Aprianingsih, 2018). Various initiatives have been undertaken to improve the quality and sustainability of coffee production. The domestic coffee market has also grown rapidly, with an increasing number of modern cafes in major cities helping to raise appreciation for local coffee (Nurhasanah & Dewi, 2019).

The coffee industry in Indonesia is one of the plantation industries that plays a strategic role in supporting the national economy, particularly in the agricultural sector—according to data released by the Central Bureau of Statistics, known in Indonesia as Badan Pusat Statistik (BPS) in 2023, Indonesia's total coffee production reached 758,725 tons, making it one of the largest coffee producers in the world. This production is spread across various regions, with major production centres located in provinces such as South Sumatra, Lampung, Aceh, South Sulawesi, and East Java. In addition to being a leading export commodity, the coffee industry also contributes significantly to the growth of the fashion business in Indonesia.

Coffee roasteries in Indonesia are an important part of the coffee industry value chain, playing a role in processing raw coffee beans (green beans) into ready-to-consume roasted beans (Kusmulyono et al., 2023). In recent years, the number of roasteries has grown rapidly along with the rise of the speciality coffee trend and increasing consumer awareness of quality and coffee origin (Mamonto et al., 2024; Hermanto & Agustian, 2023). Roasteries not only function as production sites but also serve as centres for education and flavour exploration, where coffee beans from various regions of Indonesia are roasted with specific profiles to bring out their unique flavour characteristics. Many roasteries also establish direct relationships with farmers or cooperatives to ensure transparency, quality, and sustainability. The growing number of coffee roasteries in Indonesia contributes to the development of a more advanced, sustainable, and quality-oriented coffee ecosystem.

However, behind the rapid growth of coffee roasteries in Indonesia, there are still various supply chain issues faced by industry players. One of the main challenges is the instability of high-quality coffee bean supply, caused by factors such as harvest seasons, climate change, and limited access to premium coffee farmers or

producers (Nuraisyah et al., 2025; Muhammad et al., 2023). In addition, a lack of transparency in the distribution process, fluctuations in raw material prices, and logistical constraints, especially for roasteries located in remote areas, pose significant obstacles to maintaining consistent production. It is not uncommon for roasteries to rely on intermediaries, which can lengthen the distribution chain and affect both efficiency and the final product price. On the other hand, the lack of information and data regarding the origin of the coffee also makes it difficult for roasteries to guarantee quality and accurately communicate the story of the coffee's origin to consumers (Vicol et al., 2018). Therefore, many roasteries have started to establish direct partnerships with farmers, implement traceability systems, and build more transparent and sustainable supply chain networks.

One of the coffee roastery businesses experiencing supply chain issues is The Creator Coffee Roaster. Located in Yogyakarta City, The Creator Coffee Roaster is one of the pioneers of the coffee roastery business in the city. Having operated for approximately 13 years, The Creator Coffee Roaster focuses on processing speciality coffee beans sourced from various regions in Indonesia, such as Kerinci (Jambi), Temanggung (Central Java), Ijen (East Java), and Papandayan (West Java). The types of coffee produced are predominantly Robusta and Arabica, offered in various processing methods such as washed, honey process, anaerobic process, lactic process, and natural process.

As a business in the coffee roastery sector, The Creator Coffee Roaster faces several challenges in its supply chain. Some of the issues include slow delivery times, high logistics costs, and mismatches between supply and market demand. These conditions result in a less efficient and suboptimal distribution process. Consequently, the company's operational performance may be disrupted, reducing its competitiveness in the market. Additionally, customer satisfaction is at risk of declining due to uncertainty in product availability and delivery timeliness.

However, with the increasing demand for high-quality coffee, The Creator Coffee Roaster faces challenges in maintaining and ensuring a smooth supply chain from farmers. Inefficiencies in the supply chain, such as slow delivery times, high logistics costs, and mismatches between supply and market demand, can affect the company's overall performance (Hendricks & Singhal, 2014). Therefore, a comprehensive evaluation of the green coffee beans supplier farmers' supply chain process is needed to improve efficiency and competitiveness in the increasingly competitive coffee market (Rivaldi et al., 2022).

By assessing supply chain efficiency, The Creator Coffee Roaster can determine its ability to manage inputs and make evaluations if the results are inefficient. This aims to improve supply chain performance, which can also influence overall business performance, enabling The Creator Coffee Roaster to compete with competitors in the current coffee industry.

This research focuses on evaluating the supply chain performance efficiency of supplier farmers at The Creator Coffee Roaster using the DEA (Data Envelopment Analysis) method, addressing a problem in the speciality coffee supply chain among SMEs. Given that the upstream supply chain involves various dynamic factors, assessing supplier efficiency is crucial to maintaining the stability and quality of the coffee supply. This study aims to measure the efficiency of the green coffee bean supply chain using a quantitative approach that is rarely applied in this context. The

novelty of this research lies in utilising DEA, which adopts input and output variables from the SCOR 12.0 method to provide a data-driven evaluation, helping speciality coffee roastery SMEs optimise their supply chain strategies. The findings are expected to contribute to improving the efficiency and sustainability of the speciality coffee supply chain at The Creator Coffee Roaster.

RESEARCH METHOD

The research was conducted at The Creator Coffee Roaster, a speciality coffee bean processing business located at Jl. Balirejo I No.11, Muja Muju, Umbulharjo District, Yogyakarta City, Special Region of Yogyakarta 55165. The study took place from July 2024 to November 2024.

This research used a non-probability sampling method, specifically purposive sampling. The respondents in this study consist of the owner of The Creator Coffee Roaster and partner farmers. The partner farmers are those who supply green coffee beans as raw materials. These respondents were chosen because of their direct involvement in the coffee supply chain activities at The Creator Coffee Roaster. Thus, the research respondents include one owner of The Creator Coffee Roaster and four partner farmers.

The data collection techniques in this research were adjusted to the type of data needed. The data is divided into two categories: primary data and secondary data. Primary data is obtained directly from the first source, while secondary data is used to support or complement the primary data. Primary data was collected through interviews and observations, whereas secondary data was obtained from supply chain records from previous years.

The data analysis method used to analyse all the research questions is to analyse the supply chain efficiency using the DEA method with input and output variables adapted from the SCOR 12.0 performance matrix. The SCOR method is designed to provide a comprehensive overview of each stage in the customer demand fulfilment process, from planning to delivery (Ikatrinasari et al., 2020). SCOR enables the evaluation of a company's performance from upstream to downstream, covering the entire supply chain. Its advantage lies in its ability to assess the overall process, unlike other methods that typically focus only on a company's internal aspects (Chotimah et al., 2018). With a more comprehensive approach, SCOR offers a broader perspective to improve supply chain efficiency and performance.

DEA is a mathematical model that relies on linear programming techniques to analyse the efficiency of each DMU (Decision Making Unit) with the aim of minimising inputs and maximising outputs (Puarada et al., 2020; Indriani et al., 2024; Kabeakan et al., 2024). In addition to assessing the efficiency of supply chain performance, research using the DEA method can also produce potential improvement (PI) values, which can serve as a reference for providing recommendations to achieve efficient supply chain performance (Uula & Rahayu, 2022). The PI value is obtained by subtracting the actual value from the target value, then dividing it by the actual value and multiplying it by 100%. The calculation of the PI value aims to reduce excessive input usage, allowing for the determination of target improvement values, or to increase output usage to achieve optimal performance.

The variables used to measure the efficiency of the supplier's green bean supply chain performance consist of two types: input variables and output variables. The determination of these variables refers to the SCOR 12.0 performance matrix, adjusted to the conditions of the supply chain in the field. The input variables include cash-to-cash cycle time and order fulfilment cycle time. Meanwhile, the output variables include perfect order fulfilment and delivery performance. The selection of input and output variables used in this study is adopted from the SCOR (Supply Chain Operation Reference) 12.0 evaluation model. The selection process was carried out by eliminating several variables to align with the supply chain conditions of The Creator Coffee Roaster.

The analysis using the DEA method is conducted by grouping, comparing, and calculating numerical data. The data analysis used in the DEA method will utilise the Baxia Frontier Analyst Software. The DEA method is highly suitable for analysing the supply chain performance efficiency of SME coffee roasteries because it can measure the relative efficiency of various decision-making units by considering multiple inputs and outputs simultaneously. Additionally, DEA does not require assumptions about the production function form, making it more flexible in capturing the unique characteristics of speciality coffee supply chains that vary among SMEs. With a data-driven approach, DEA provides an objective quantitative evaluation, helping SMEs identify areas for improvement to enhance operational efficiency and business sustainability.

The mathematical model formulation of the Data Envelopment Analysis (DEA) method, which is commonly used to measure the relative efficiency of a DMU, is as follows.

Efficiency = Weighted Total Output/Weight Total Input

$$Eb = \frac{\sum_{r=1}^{R} u_{rb} y_{rb}}{\sum_{i=1}^{I} v_{ib} x_{ib}}, \ldots\ldots\ldots\ldots\ldots\ldots\ldots(1),$$

Constraint function

$$\frac{\sum_{r}^{R} u_{rb} y_{rj}}{\sum_{i}^{I} v_{ib} x_{ij}} \leq, \forall j, j = 1,2,3,\ldots, N\ldots\ldots(2),$$

and

U_{rb}, $v_{ib} \geq$ for each r,I (where r = 1,2,3,…,R and i = 1,2,3,..I)

Explanation: e_b is the efficiency of unit b; y_{rj} is the quantity of output rrr produced by unit j = 1,2,…., N; x_{ij} is the quantity of input iii produced by unit j = 1,2,…., N; u_{rb} is the weight assigned to output r based on unit b; v_{ib} is the weight assigned to input i based on unit b; e_b is a minimal positive number.

The DEA method will assess the efficiency of each DMU on a scale from 0 to 1. DMUs that perform well and are efficient will receive an efficiency score of 1, while those with lower performance will receive an efficiency score greater than 0 and less than 1 (Charner et al., 2005 in Pulungan, 2019). Inefficient DMUs will be allowed to improve their performance by referring to other DMUs that are already efficient, thus providing solutions for performance improvement within the supply chain.

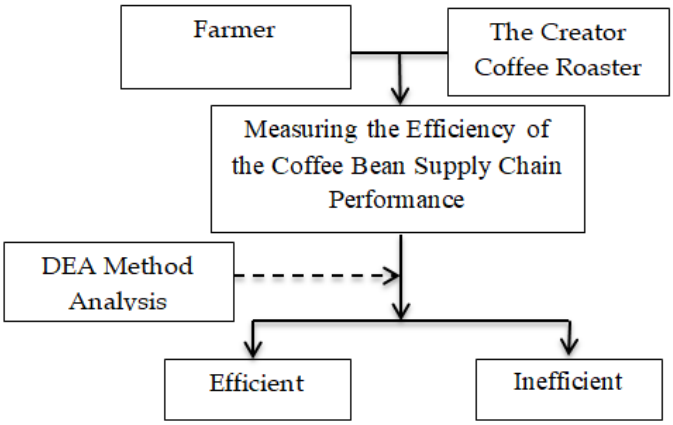

Figure 1.
Conceptual Framework

The efficiency analysis flow of the coffee bean supply chain involves two main actors: farmers and coffee processing businesses (The Creator Coffee Roaster). These two actors play a role in the coffee bean supply chain process, starting from production at the farmer level to processing and distribution by the business actors. The main objective of this framework is to measure the efficiency of the coffee bean supply chain performance as a basis for evaluating and improving a sustainable distribution and production system.

For the supply chain efficiency analysis, several input and output variables are used. These variables refer to the SCOR 12.0 performance matrix, adjusted to the actual conditions of the supply chain in the field. Inputs used for the partner farmer DMUs include order fulfilment cycle time and cash-to-cash cycle time, while the outputs include perfect order fulfilment and delivery performance. The input and output variables from the SCOR matrix are adapted to the real conditions of the coffee supply chain.

RESULT AND DISCUSSION

Respondents Profile

The Creator Coffee Roaster is a coffee bean processing business established in 2012 by Andry Mahardika and Echi Mahardika. Starting from his profession as a barista, Andry Mahardika identified an opportunity in the roasted coffee bean production industry, which attracted many enthusiasts, especially home brewers. Having operated for approximately 12 years, The Creator Coffee Roaster has become a pioneer in the development of the roastery business in Yogyakarta, which initially only had three roasteries in the city. The motivation behind the establishment of this business was the owner's desire to produce high-quality roasted coffee beans at an affordable price. Over time, The Creator Coffee Roaster has expanded its production to include roasted coffee beans sourced from various regions such as Gayo (Aceh), Mandailing, Kerinci (Jambi), Mount Papandayan, Temanggung, Ijen (Bondowoso), Toraja, and Papua (Source: The Creator Coffee Roaster, 2024).

The growth of The Creator Coffee Roaster has led to widespread use of its roasted coffee bean products, ranging from home brewers to coffee shops in and

around Yogyakarta and beyond. In addition to producing local roasted coffee beans, The Creator Coffee Roaster has expanded its offerings to include imported beans from Costa Rica, Guatemala, and Ethiopia. The variety of roasted coffee beans produced creates diverse flavour profiles, prompting The Creator Coffee Roaster to provide detailed taste notes for each product. This information helps users prepare coffee according to their individual preferences, aligning with the tagline "Be The Creator," which represents the company's mission.

Supply Chain Performance Efficiency of Partner Farmers

In supply chain management (SCM), there are three types of flows: the flow of goods, the flow of money, and the flow of information (Fachrezi et al., 2024). The flow of goods refers to the movement of products at each point in the supply chain. The flow of money represents the amount of money circulating at each link in the supply chain. Meanwhile, the flow of information refers to the information that circulates within the supply chain.

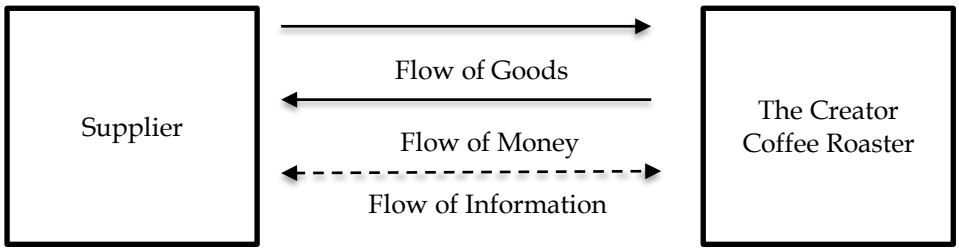

Figure 2.
Supply Chain Flow Graph

Each type of flow in the supply chain has a different movement pattern. The flow of goods moves from upstream to downstream, starting from raw material suppliers to end consumers. On the other hand, the flow of money travels from downstream to upstream, where payments made by consumers move back through retailers, distributors, and eventually to suppliers. Meanwhile, the flow of information is bidirectional, as it is essential for coordinating supply and demand, managing inventory, and ensuring timely decision-making. Effective management of these three flows is crucial to achieving efficiency, responsiveness, and sustainability within the entire supply chain system.

Supply chain efficiency analysis aims to assess the company's target achievement, particularly in the green coffee beans supply chain at The Creator Coffee Roaster. This analysis examines input and output factors, with performance measurement over one year, from January to December 2023, involving green coffee bean supplier farmers. The green coffee beans suppliers partnering with The Creator Coffee Roaster come from several regions, such as Temanggung, Ijen (Bondowoso), Kerinci, and Garut.

The supply chain performance efficiency of suppliers is evaluated based on the number of suppliers selected to provide green coffee beans to the agro-industry of The Creator Coffee Roaster in 2023, totalling 4 suppliers. The evaluation of the supply chain performance efficiency of partner farmers is conducted to assess whether each partner farmer's performance is efficient or still lacks efficiency. The

collected data will be entered into the input and output variables of each partner farmer. The results of this analysis serve as a consideration for the agro-industry in establishing future partnerships with partner farmers. A summary of the input and output variable values for partner farmers is presented in Table 1.

Table 1. Summary of Input and Output Variable Values for Partner Farmers at The Creator Coffee Roaster During 2023

No	DMU	Input Variable		Output Variable	
		Cash to Cash Cycle Time (days)	Order Fulfilment Cycle Time (hours)	Delivery Performance (%)	Order Fulfilment (%)
1	Supplier 1	14	7	100	100
2	Supplier 2	4	4	100	100
3	Supplier 3	14	6	83	100
4	Supplier 4	15	4	83	100

Data collection for each input and output variable was based on direct interviews with partner farmers and The Creator Coffee Roaster. Detailed calculations of each data variable are attached in Table 1. The following explains the input and output variable values from partner farmers to the agro-industry during 2023.

The input variables used to assess the efficiency of the green coffee beans supply chain performance are determined based on the actual conditions at The Creator Coffee Roaster. The following is an explanation of each input variable:

Cash-to-Cash Cycle Time

Cash-to-Cash Cycle Time is the average time required by The Creator Coffee Roaster to make payments to green coffee bean suppliers. In the supply chain, measuring supply lead time is essential to determine how quickly inventory can be turned into profit (Agamis et al., 2023). The payment time from The Creator Coffee Roaster to suppliers was previously agreed upon at the time of the ordering transaction. Both parties have also approved this payment system. Payments from The Creator Coffee Roaster to partner farmers are made through several mechanisms, such as payment terms with a maximum of two weeks and payment on the subsequent order. In The Creator Coffee Roaster's supply chain flow, payment to green coffee bean suppliers based on the cash-to-cash cycle time takes between 4 and 14 days, according to the agreed terms. The payment period made by The Creator Coffee Roaster to each green coffee bean supplier over a year naturally varies.

A long cash-to-cash cycle time can affect farmers' liquidity, especially if payments approach the agreed maximum limit of 14 days. Although this timeframe is relatively short compared to some other industries, farmers often rely on prompt payments to cover operational costs such as labour, fertilisers, and equipment (Agustin et al., 2021). Uncertainty in payment schedules, which vary throughout the year, can make financial planning more challenging for farmers, reducing their capacity to invest in quality improvements or production increases (Hasni & Paranoan, 2023; Rodiana et al., 2014). Therefore, while payment mechanisms like "payment on subsequent orders" provide flexibility for The Creator Coffee Roaster,

a consistent approach is needed to maintain farmers' financial stability and support the sustainability of the supply chain.

Order Fulfilment Cycle Time

The value of order fulfilment cycle time (OFCT) is measured by calculating the average number of days required to deliver products to customers, starting from the receipt of the order to the delivery of the goods to the customer (Erlina, 2020). The order fulfilment cycle time is the time required by partner farmers to fulfil green coffee bean orders from The Creator Coffee Roaster. Each supplier farmer has different fulfilment times. The data used includes the initial time of green coffee beans ordering by The Creator Coffee Roaster to the supplier, up until the time of delivery by the supplier and the arrival of green coffee beans at The Creator Coffee Roaster's location. The time unit used is days to ensure the accuracy of the delay in the arrival of green coffee beans at The Creator Coffee Roaster. The time needed to fulfil the green coffee beans supply from all supplier farmers is calculated in 4-7 days.

The differences in order fulfilment cycle time among farmers are caused by logistics coordination, variations in post-harvest readiness, or limited transportation efficiency. To address these delays, The Creator Coffee Roaster can implement better logistics planning by standardising delivery schedules across all suppliers and using centralised coordination for shipment tracking. Additionally, the implementation of simple technological interventions such as real-time order monitoring systems or mobile-based communication tools can help improve visibility, ensure timely updates, and reduce response time across the supply chain.

Output variables are used to assess supply chain activities in terms of delivery performance and compliance with standards by supply chain actors. These output variables are important for determining the weight of each DMU or supplier collaborating with The Creator Coffee Roaster. Below is an explanation of each output variable.

Delivery Performance

Delivery performance variables are output variables used to measure how well or poorly the green coffee beans' delivery performance is from suppliers to The Creator Coffee Roaster. This performance focuses on the timeliness of green coffee bean deliveries over the past year, 2023. Based on Table 1, it is known that suppliers 1 and 2 received a score of 100%, and suppliers 3 and 4 received 83%. Farmers 1 and 2 achieved a delivery performance score of 100% because there were no delays in their deliveries. Meanwhile, Farmers 3 and 4 received a score of 83% due to experiencing two delivery delays: Farmer 3 (March & December) and Farmer 4 (July & August).

These figures indicate that the suppliers experienced delivery delays, but they were still within the tolerance limits. Factors contributing to these delays include transportation conditions that were not smooth, limited green coffee bean supply from suppliers, leading to postponements, and a lack of effective communication between the suppliers and The Creator Coffee Roaster.

Order Fulfillment

Order fulfilment is the percentage of green coffee bean requests that can be met by partner farmers without delay, meaning the partner farmers can deliver green coffee beans according to the agreed delivery time with The Creator Coffee Roaster.

All four partner farmers of The Creator Coffee Roaster consistently deliver green coffee beans on time with an order fulfilment rate of 100%. Based on the total orders from The Creator Coffee Roaster to the partner farmers, a total of 15,298 kg of orders can be fulfilled by the partner farmers. This fulfilment of green coffee beans orders is consistently met due to good communication between the owner of The Creator Coffee Roaster and the partner farmers to meet each monthly green coffee beans request.

The summarised input and output variable values were then analysed using the DEA (Data Envelopment Analysis) method to measure the supply chain performance efficiency of each green coffee bean supplier to The Creator Coffee Roaster in 2023. The DMU with the best performance will have an efficiency level expressed as 100%. In contrast, other DMUs below it will have varying efficiency levels, ranging between 0% and 100% (Retno, 2019, as cited in Sanjaya & Budi, 2020). The results of this analysis can help identify suppliers with efficient supply chain performance and those with less efficient performance. The recap of the supply chain performance efficiency analysis for green coffee bean suppliers to The Creator Coffee Roaster in 2023 can be seen in Table 2.

Table 2. Analysis of Supply Chain Performance Efficiency of Partner Farmers using the DEA Method with the help of Frontier Baxia Analyst Software.

No	Supplier (DMU)	Supply Chain Performance Efficiency Value (%)	Efficiency Level Category
1	Supplier 1	57.1	Inefficient
2	Supplier 2	100	Efficient
3	Supplier 3	66.7	Inefficient
4	Supplier 4	100	Efficient

Based on the results in Table 2, it was found that the DEA method analysis showed that two farmers had achieved efficiency, while two others had not. According to (Charnes et al., 2005, as cited in Pulungan et al., 2019), efficiency measurement results using the DEA method indicate that if the efficiency score equals 1, it is considered efficient. In contrast, if the score falls within the range of $0 \leq x < 1$, it is considered inefficient. The two farmers who achieved efficiency are Supplier Farmer 2 and Supplier Farmer 4, each attaining an efficiency score of 100%. Meanwhile, the two other farmers who had not achieved efficiency are Supplier Farmer 1 and 3, with scores of 57.1% and 66.7%, respectively.

The results are also in line with research conducted by Aswat et al., (2023), where the input variables analysed include lead time for purchase fulfilment, purchase fulfilment cycle, supply chain flexibility, and total supply chain costs, while the output variables include compliance with standards, sales, and purchase fulfilment. The research findings indicate that the performance of robusta coffee farmers in Batu Ampar Subdistrict is already efficient, with 66.67% of farmers being classified as efficient. Robusta coffee farmers in the "red" condition are found in DMU 1 and DMU 2, suggesting the need for improvements by examining their potential.

Supplier Farmer 1

Based on the DEA analysis, Supplier Farmer 1 has an efficiency score of 57.1% due to inefficiencies in input variables, specifically the cash-to-cash cycle time and

order fulfilment cycle time. The inefficiency in the cash-to-cash cycle for Farmer 1 arises from the 14 days required, which exceeds the agreed payment term of a maximum of 2 weeks. This figure is considered less efficient compared to Farmer 2's cash-to-cash cycle time, which only takes 4 days. For the order fulfilment cycle time variable, the inefficiency is due to Farmer 1 needing 7 days to fulfil orders for The Creator Coffee Roaster. This is still categorised as inefficient because it takes longer compared to Supplier Farmer 2, who only needs 4 days.

Supplier Farmer 2

The DEA analysis results indicate that Supplier Farmer 2 achieved an efficiency score of 100%, making them the only farmer to achieve efficiency compared to other suppliers. For the input variables of cash-to-cash cycle time and order fulfilment cycle time, Supplier Farmer 2 requires only 4 days to receive payments and fulfil orders. Regarding the output variables of delivery performance and order fulfilment, Supplier Farmer 2 scored 100% as they consistently deliver goods on time and meet the agreements with The Creator Coffee Roaster.

The achievement of an efficient supply chain performance by Supplier Farmer 2 has made it the performance standard for Supplier Farmers 1, 3, and 4. The supply chain performance standard of Supplier Farmer 2, in terms of input variables, includes a cash-to-cash cycle time and order fulfilment cycle time of only 4 days. Meanwhile, in terms of output variables, Supplier Farmer 2 has never experienced delivery delays. In the order fulfilment variable, they have always been able to meet orders from The Creator Coffee Roaster.

Supplier Farmer 3

The DEA analysis results show that Supplier Farmer 3 has an efficiency score of 66.7%, due to inefficiencies in both input and output variables. For the input variable of cash-to-cash cycle time, Supplier Farmer 3 requires 14 days for payment under a payment scheme of 2 weeks after order placement. This duration is relatively longer than Supplier Farmer 2, who requires only 4 days. For the order fulfilment cycle time, Supplier Farmer 3 needs 6 days, which is still inefficient compared to Supplier Farmer 2, who only requires 4 days.

In addition to input variable inefficiencies, Supplier Farmer 3's inefficiency is also influenced by the output variable, specifically delivery performance. Supplier Farmer 3 experienced two delays in March and December 2023. The delays in March and December took 12 days and 10 days, respectively, which are relatively longer than the average delivery time of 5 days in other months.

Supplier Farmer 4

The DEA analysis results show that Supplier Farmer 4 achieved an efficiency score of 100%. However, despite this score, Supplier Farmer 4 is still categorised as "amber" (yellow). According to (Hussain & Jones, 2010, as cited in Duwimustaroh et al., 2016), an efficiency score above 90% but below 100% (with potential improvement) falls under the "amber" category, while a score of 100% without potential improvement falls under the "green" category. The analysis revealed that the variables preventing Supplier Farmer 4 from achieving full efficiency are the input variable of cash-to-cash cycle time and the output variable of delivery performance .

For the input variable of cash-to-cash cycle time, Supplier Farmer 4 requires 15 days for payment, which is longer compared to Supplier Farmer 2, who only needs 4 days. For the output variable of delivery performance, Supplier Farmer 4 experienced two delays in July and August, each taking 6 days. These delivery times are longer than the average delivery time of 3 days.

The results are also supported by the study conducted by Maulida & Megayanti (2016), where, out of 15 DMUs analysed, 4 DMUs were found to be in the Amber condition. This condition, with a range of values between 90-99.9, indicates that the project may be at risk if the existing issues are not addressed promptly, thus requiring special attention.

The inefficiencies of supplier farmers in The Creator Coffee Roaster's supply chain have several significant implications. Supplier Farmers 1 and 3 face issues with cash-to-cash cycle time and order fulfilment cycle time, which are longer compared to Supplier Farmer 2. A cash cycle time of 14 days risks hampering farmers' liquidity, limiting their ability to finance operations such as purchasing raw materials and labour. Additionally, delays in order fulfilment, especially for Supplier Farmer 1 (7 days) and Supplier Farmer 3 (6 days), can disrupt the smooth flow of the supply chain and reduce customer trust. Another issue arises from the delivery performance of Supplier Farmers 3 and 4, which have experienced delays, potentially affecting changes in The Creator Coffee Roaster's production schedule.

Cultural, economic, and logistical factors in Yogyakarta or Indonesia may contribute to the observed inefficiencies, as seen in Supplier Farmer. Culturally, traditional approaches to financial management, such as delays in the cash-to-cash cycle of up to 15 days, may reflect a local preference for trust-based payment systems that are not always efficient. Economically, limited access to capital or technology may hinder improvements in input variables like payment efficiency and delivery performance (Marwanto, 2024; Anam & Yosepha, according to Rahmatika et al., 2024), logistically, inadequate infrastructure in rural areas can lead to delivery delays, such as the two incidents in July and August, where delivery times were twice as long as the standard. This combination of factors highlights the need for focused attention to address these issues through cultural, economic, and logistical support.

CONCLUSION

Since its establishment in 2012, The Creator Coffee Roaster has successfully grown into a pioneer in the roastery business in Yogyakarta by emphasising high-quality roasted coffee beans at affordable prices. A supply chain efficiency analysis in 2023 showed that only two out of four partner farmers achieved full efficiency, while the other two were still less efficient. The main factors affecting efficiency were the cash-to-cash cycle time and order fulfilment cycle time, along with delivery obstacles caused by transportation and communication issues. Through this evaluation, the company can measure its ability to manage inputs and improve supply chain performance, which ultimately contributes to its business competitiveness in the coffee industry.

Efficiency improvements can be achieved through consistent payment practices, faster delivery, and stronger communication with farmers. For partner farmers who are still inefficient, solutions include using sack sealing machines, evaluating delivery service providers, and utilising stock management software. The

Creator Coffee Roaster is also advised to expand its network of partner farmers to reduce the risk of supply shortages. These practices can also serve as a reference for other speciality coffee SMEs. For future research, it is recommended that the Data Envelopment Analysis method include more input and output variables so that efficiency measurement becomes more comprehensive and reflects the various activities within supply chain management.

AUTHOR CONTRIBUTION STATEMENT

[Author 1]: conceptualization, data collection, data analysis, and writing original draft; [Author 2]: research supervision, methodological guidance, and critical review of the manuscript; [Author 3]: Analytical guidance, validation of results, and writing review and editing.

DECLARATION OF COMPETING INTEREST

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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ETHIC STATEMENT

Ethical review and approval were waived for this study as it did not involve any intervention and posed minimal risk to participants. Nevertheless, informed consent was obtained from all respondents prior to participation, and all data were anonymised and kept confidential.

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