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Advancing Supply Chain Efficiency Through Sustainable Procurement Practices: Evidence from Sachet Water Manufacturing Firms

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Abstract

Aim: This study examines the role of ethical procurement practices in enhancing operational efficiency, reducing costs, minimizing waste, and improving overall supply chain performance in the sachet water manufacturing industry.

Methods: This study employed a descriptive, cross-sectional research design, utilizing primary data collected through a structured survey administered to 170 employees and managers from sachet water manufacturing firms. Data analysis was conducted using SPSS, incorporating descriptive statistics, correlation, regression, and reliability tests. The reliability of the constructs is confirmed by the high Cronbach's alpha values, with EP and OP showing a high degree of internal consistency at 0.833 and 0.865, respectively. In addition, a Kaiser-Meyer-Olkin (KMO) value of 0.916 and a significant Bartlett's test ($p < 0.05$) confirm the excellent sampling adequacy and the construct validity, thus supporting the suitability of the data for factor analysis.

Results: Correlation analysis highlights the significant role of ethical sourcing in driving operational performance, underscoring the importance of integrating sustainability into procurement strategies. Multiple regression analysis further identifies EP as a key predictor of operational performance, while non-significant predictors suggest areas for future research. Although multicollinearity is not a major concern, caution should be exercised when interpreting variables with higher variance inflation factors (VIFs). The normality of the residuals in the regression model is reasonably satisfied, reinforcing the reliability of the findings.

Conclusion: The study concludes that prioritizing ethical procurement can substantially improve supply chain efficiency.

Recommendation: These results provided actionable insights for practitioners to prioritize ethical sourcing practices to improve supply chain efficiency. They also provide a foundation for researchers to explore other operational performance drivers**.**

Keywords: *Sustainable procurement, ethical procurement, operational performance, supply chain efficiency, construct validity, multicollinearity.*

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INTRODUCTION

In the rapidly growing sachet water industry where affordability, accessibility, and hygiene intersect to meet the daily drinking water needs of millions across developing countries, sustainability and operational efficiency have become critical survival factors. Yet, this sector is plagued by high plastic waste generation, energy-intensive production processes, and fragmented supply chains that often rely on low-cost, unregulated suppliers (Corigliano & Algieri, 2024). These challenges not only threaten environmental sustainability but also compromise operational performance through increased costs, supply disruptions, and reputational risks. As governments and consumers demand greater accountability and eco-conscious practices, sachet water manufacturers face mounting pressure to adopt ethical procurement strategies that align with both profitability and planetary health (Shee, 2024). Also, with increasing global concern about climate change, resource scarcity, and environmental destruction, companies are increasingly adopting sustainable procurement practices to improve supply chain efficiency while meeting environmental and social obligations (Lăzăroiu *et al.,* 2020; Thorlakson *et al.,* 2018; Carter & Rogers, 2008; Seuring & Müller, 2008).

Sustainable sourcing refers to integration of environmental and social considerations into purchasing decisions to minimize negative impacts throughout the supply chain (Johnsen *et al.,* 2018). Integrating ethical sourcing practices into supply chain operations is a critical strategy for improving operational efficiency, particularly in industries with significant environmental and social impacts. Ethical procurement is the process of procuring goods and services emphasizing the principles of fairness, transparency, environmental protection, and social responsibility (Mwambuli, 2023). This has become increasingly important as companies seek to balance profitability with sustainability. The sachet water manufacturing industry, a sector that plays a vital role in provision of affordable drinking water in many developing countries, faces numerous challenges related to plastic waste, resource inefficiency, and unethical supplier practices (Ahiabor & Donkor, 2025).

The production of sachet water is differentiated by its high energy consumption, dependence on single-use plastics, and disjointed supply chain with multiple small-scale suppliers. These elements make it easier for unethical activities to occur, such as obtaining subpar materials, abusing workers, or disregarding environmental laws (Durowoju *et al.,* 2022). By raising expenses, lowering product quality, and harming brand reputation, such behaviors not only impair operational efficiency but also negatively impact society and the environment. On the other hand, using ethical procurement methods can lead to improved supply chain performance, including decreased waste, strengthened relationship with suppliers, and more efficient operations (Nwankwo & Nwankwo, 2022). Operational efficiency is an organization's capacity to maximize output while minimizing raw materials to reduce costs, expedite delivery, and increase productivity (Raval *et al.,* 2020; Pagell & Wu, 2009).

In the context of this study, operational efficiency refers to the ability of sachet water manufacturing firms to maximize output (e.g., production volume, service delivery, product quality) while minimizing input resources (e.g., cost, time, labor, energy, and materials) to achieve cost-effective, timely, and high-quality production processes. Mean operational efficiency is a priority for sachet water manufacturing firms. This is propelled by industry's intense competition and the desire to satisfy increasing consumers' demand for safe drinking water at a competitive

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price. By lowering risks, improving teamwork, and encouraging sustainable resource use, ethical procurement practices such as selecting suppliers based on their compliance with labor and environmental standards, guaranteeing transaction transparency, and cultivating long-term partnerships have a positive impact on operational efficiency (Agyapong *et al.,* 2024).

There are still more unanswered questions about ethical and sustainable buying practices, especially firms that make sachet water. The majority of research on ethical procurement focuses on sectors including large-scale manufacturing, electronics, textiles, and automobiles (Botta, 2024; Wilhelm & Villena, 2021; Kim *et al.,* 2018). There are few studies in the sachet water production industry, which is vital to the supply of inexpensive drinking water in poor nations. The unique characteristics of this industry necessitate tailored research to understand how ethical procurement can be effectively implemented to enhance operational efficiency. Also, existing research often emphasizes the environmental and social benefits of ethical procurement, such as reduced carbon emissions and waste minimization. They do not adequately explore its impact on operational metrics such as cost reduction, delivery time optimization, and productivity (Adebayo *et al.,* 2024). Walker *et al.,* 2008). This creates a gap in understanding how ethical procurement directly contributes to improving operational efficiency, mainly in sachet water manufacturing firms, where cost and delivery times are critical.

Also, existing studies often examine ethical procurement in isolation, without considering its integration with other supply chain functions, such as production, logistics, and distribution (Hughes *et al.,* 2019). This fragmented approach limits understanding of the broader impact of ethical procurement on operational efficiency. A holistic analysis that explores the interplay between ethical procurement and other supply chain functions is needed to fully assess its contribution to the operational efficiency of sachet water manufacturing firms. Finally, while ethical procurement is widely acknowledged as a driver of sustainability, its direct impact on operational efficiency remains underexplored (Islam *et al.,* 2017). Few studies have empirically tested the relationship between ethical procurement decisions and key performance indicators such as cost savings, waste reduction, and delivery time optimization (Ojijo, 2023). For example, Bai and Sarkis (2014) identify key sustainable performance indicators (KPI) that can then be used to measure sustainable performance of suppliers. This gap highlights the need for empirical research to establish a clear link between ethical procurement and operational efficiency, particularly among sachet water manufacturing firms where efficiency is critical to competitiveness.

The identified gaps in the literature highlight the need for a focused study on the relationship between ethical procurement and operational efficiency in the sachet water manufacturing sector. By addressing these gaps, this study aims to contribute to both academic discourse and practical applications. The impact of this study extends far beyond its immediate scope, offering valuable contributions to theory, practice, and policy. By empirically validating the relationship between ethical procurement and operational efficiency, the study provides a roadmap for firms to achieve sustainable growth while addressing pressing environmental and social concerns. Its findings not only advance academic knowledge but also empower practitioners, policymakers, and stakeholders to take meaningful action toward building efficient, ethical, and sustainable supply chains.

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LITERATURE REVIEW

Theoretical Propositions

The Theory of Planned Behavior (TPB)

The Theory of Planned Behavior (Ajzen, 1991) suggests that attitudes, subjective norms, and perceived behavioral control influence behavioral intentions. In the context of sachet water firms, attitudes toward sustainability, stakeholder pressures, and perceived ability to implement ethical sourcing explain the likelihood of adopting ethical procurement practices. TPB is suitable for this study because procurement decisions are behavioral and influenced by organizational attitudes, social pressures, and perceived control. According to TPB, attitude refers to the degree to which an individual or organization evaluates a behavior as positive or negative. In the context of sustainable procurement practices, firms with a favorable attitude toward ethical procurement are more likely to adopt such practices. Ethical procurement often involves selecting suppliers who adhere to environmental and social standards. This can lead to reduced supply chain risks, improved supplier relationships, and better-quality inputs, all of which contribute to operational efficiency. For example, adopting ethical procurement practices in sachet water manufacturing firms may involve sourcing raw materials from suppliers who use renewable energy or minimize plastic waste, thereby reducing costs associated with regulatory penalties or reputational damage (Prajogo *et al.,* 2012).

Studies have shown that organizations with strong environmental attitudes are more likely to engage in sustainable procurement practices, which in turn enhance operational performance (Etse *et al.,* 2013). This aligns with TPB's assertion that a positive attitude toward a behavior increases the likelihood of its adoption. Subjective norms refer to the perceived social pressure to perform or not perform a behavior. In the context of ethical procurement, subjective norms stem from pressures exerted by stakeholders such as customers, regulators, investors, and employees. When stakeholders demand sustainable practices, firms are incentivized to adopt ethical procurement strategies. For instance, consumers increasingly prefer environmentally friendly products, and regulatory bodies impose stricter environmental standards. These pressures can drive firms to optimize their supply chains, leading to greater efficiency (Kalaitzi *et al.,* 2019). In the sachet water industry, where environmental concerns about plastic waste are significant, firms face mounting pressure to adopt sustainable procurement practices. This external influence can encourage firms to streamline operations, reduce waste, and improve resource allocation, thereby enhancing operational efficiency (Bakare *et al.,* 2024).

Shubham *et al.* (2018) emphasize that stakeholder pressures can act as catalysts for sustainability initiatives, which ultimately benefit operational processes. Similarly, Bakare *et al.* (2024) highlight the role of regulatory and consumer pressures in driving firms toward sustainable practices. Perceived behavioral control reflects an individual's or organization's belief in their ability to execute a specific behavior. In the context of ethical procurement, this pertains to the firm's confidence in its ability to implement sustainable sourcing practices despite potential challenges such as limited supplier options or higher costs. Firms with high perceived behavioral control are more likely to invest in sustainable procurement practices, knowing they can overcome obstacles. This confidence enables them to build resilient supply chains, reduce disruptions, and achieve cost savings, all of which contribute to operational efficiency (Zhao *et al.,* 2023). A firm confident in its ability to source biodegradable packaging materials or work with suppliers who adhere to

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ethical labor practices will likely experience fewer disruptions and lower long-term costs. Zhu *et al.* (2008) argue that perceived behavioral control is a critical factor in the successful implementation of green supply chain practices, which directly impacts operational outcomes. The theory of planned behavior offers valuable insights into how ethical procurement practices can advance supply chain efficiency in sachet water manufacturing firms. By fostering positive attitudes, responding to stakeholder pressures, and building confidence in implementing sustainable practices, firms can achieve significant improvements in operational efficiency. However, TPB focuses on intention rather than actual performance outcomes, which this study addresses by linking ethical procurement behaviors to operational efficiency.

Empirical Review

Sustainable Procurement Practices

Ethical procurement integrates environmental, social, and governance (ESG) criteria into sourcing decisions, prioritizing sustainability across the triple bottom line (people, planet, profit). For the sachet water industry - a sector facing intense scrutiny over plastic waste and water stewardship, this approach directly enhances operational resilience and efficiency. By selecting suppliers of recyclable/biodegradable materials (Nasrollahi *et al.,* 2020) and investing in energy-efficient technologies (Onukwulu *et al.,* 2023), firms reduce material/energy waste and long-term costs (Amaral *et al.,* 2020; Pimenov *et al.,* 2022). For sachet producers, this translates to lower expenses in raw materials, waste management, and carbon compliance. Ethical procurement ensures supplier adherence to labor and environmental regulations (Hughes *et al.,* 2019), minimizing disruptions from non-compliance penalties or community conflicts.

In water-stressed regions, sourcing from suppliers with sustainable water practices safeguards against scarcity-driven shortages (Lăzăroiu *et al.,* 2020). Collaborative supplier relationships further foster innovation in packaging design and resource efficiency (Grant, 2024). Consumer demand for eco-friendly products and investor focus on ESG metrics (Lăzăroiu *et al.,* 2020) pressure sachet water firms to adopt ethical sourcing. Procuring locally or from minority-owned businesses (Bates *et al.,* 2022) not only strengthens community ties but also enhances brand reputation, unlocking market share and investor confidence. Regulatory compliance (e.g., plastic bans) thus becomes a driver of operational innovation rather than a constraint. For the sachet water industry, ethical procurement is a strategic lever. It transforms environmental and social challenges (plastic pollution, water ethics) into opportunities for cost savings, supply chain stability, and competitive differentiation - directly elevating operational performance.

Supply Chain Efficiency

In the context of the sachet water manufacturing industry, supply chain efficiency - referred to as operational efficiency, represents the ability of firms to optimize resources such as raw materials, energy, labor, and capital to reduce costs, minimize waste, and improve production output and delivery speed, all while maintaining product quality and regulatory compliance (Christopher, 2016). Given the industry's reliance on energy-intensive production processes, single-use plastics, and fragmented supplier networks, achieving operational efficiency is particularly challenging yet essential for competitiveness and sustainability. Key Performance Indicators (KPIs) for Supply Chain Efficiency encompass a range of metrics that collectively assess the effectiveness and performance of supply chain operations. Total Supply Chain Cost, as defined by Anand and Grover

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(2015) and Carter *et al.,* (2008), evaluates the overall cost efficiency by measuring expenses related to sourcing, production, and logistics. Inventory Turnover Ratio, or Inventory Utilization Rate (Pettersson, 2008), reflects the frequency with which inventory is sold and replaced, indicating efficient inventory management. Order Fulfillment Cycle Time (Helo and Shamsuzzoha, 2020) tracks the duration from order placement to delivery, serving as a measure of supply chain responsiveness and speed. According to Mironchenko (2024), defect rate assesses the proportion of defective products or services to gauge process reliability and quality control.

Supply Chain Flexibility or Responsiveness (Madhani, 2019) measures the ability of the supply chain to adapt to market and demand fluctuations, thereby enhancing competitiveness and reducing disruptions. Supplier Performance or Supplier Quality Index (Salimian *et al.,* 2021) evaluates supplier reliability, delivery performance, and the quality of goods and services, highlighting the importance of strong supplier relationships. Lead Time Variability measures the consistency of time taken in procurement, production, and delivery, with lower variability indicating more predictable and efficient operations. Cost of Quality accounts for expenses related to prevention, appraisal, and failure, helping to assess the financial implications of quality control efforts. On-Time Delivery Rate measures the percentage of orders delivered on or before the promised date, reflecting reliability and customer service performance. Lastly, Fill Rate indicates the percentage of customer orders fulfilled completely from available stock, showcasing inventory availability and the efficiency of order fulfillment. Together, these KPIs provide a comprehensive overview of supply chain performance, enabling firms to identify areas for improvement and optimize operational efficiency. The central hypothesis is that ethical procurement positively influences operational efficiency by fostering resilience, reducing risks, and enhancing resource optimization. Based on the literature, the following hypotheses are formulated:

H1: Ethical procurement practices positively influence operational efficiency in sachet water manufacturing firms.

Ethical procurement involves selecting suppliers based on environmental, social, and governance (ESG) criteria, which leads to improved supplier reliability, better quality inputs, and reduced supply chain disruptions. In the sachet water industry, characterized by high plastic waste, energy consumption, and fragmented supplier networks, ethical sourcing enhances process efficiency, reduces downtime, and ensures regulatory compliance, all of which directly enhance operational performance (Lăzăroiu *et al.,* 2020; Agyapong *et al.,* 2024).

H2: Sustainability initiatives within ethical procurement contribute to cost savings and waste reduction, thereby improving operational efficiency.

Sustainable procurement practices such as sourcing recyclable materials, reducing packaging waste, and using energy-efficient suppliers align with resource optimization goals. These initiatives reduce material and energy costs, minimize waste disposal expenses, and improve production efficiency. For sachet water manufacturers facing rising input costs and environmental scrutiny, integrating sustainability into procurement decisions leads to measurable improvements in cost efficiency and productivity (Pimenov *et al.,* 2022; Nasrollahi *et al.,* 2020).

H3: Stakeholder pressures for ethical procurement practices positively moderate the relationship between ethical procurement and operational efficiency.

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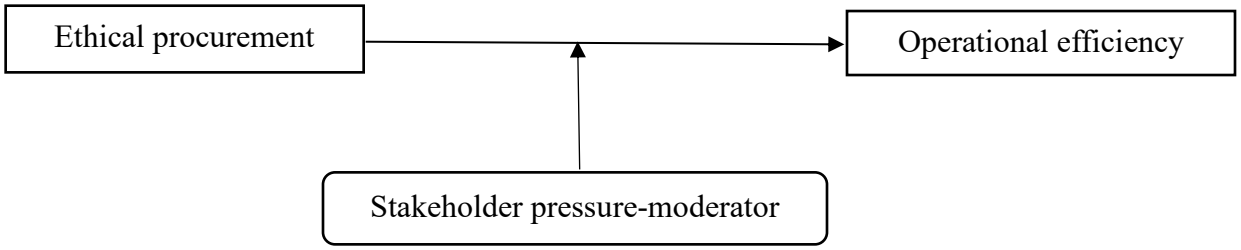
External pressures from consumers, regulators, investors, and advocacy groups push firms to adopt ethical procurement practices. When firms respond to these pressures by implementing sustainable sourcing strategies, they not only enhance their reputation but also streamline operations through better supplier collaboration, innovation, and compliance. This moderating effect strengthens the link between ethical procurement and operational efficiency, particularly in sectors like sachet water manufacturing, where environmental and social concerns are significant (Osei *et al.,* 2024; Walker *et al.,* 2008).

Conceptual Framework



METHODOLOGY

A quantitative research design was selected as it is particularly appropriate for testing hypotheses and identifying statistically significant relationships between variables, specifically, the relationship between ethical procurement practices and operational efficiency in sachet water manufacturing firms (Lund, 2022). This approach aligns directly with the primary objective of the study to empirically examine how sustainable procurement practices influence supply chain efficiency using measurable and generalizable data. Qualitative or mixed-method approaches were excluded because the focus of this study was not on exploring subjective experiences, meanings, or in-depth narratives, but rather on quantifying relationships and providing empirical support for theory- and practice-based conclusions. While qualitative insights could answer how or why ethical procurement influences performance, the current research prioritized generalizability, objectivity, and statistical rigor hallmarks of quantitative research - necessary for concluding applicable across the sachet water industry.

Thus, the quantitative survey design provided a robust foundation for hypothesis testing, supported by validity checks, reliability analysis, and regression modeling, ensuring the findings are both theoretically sound and practically actionable. A structured survey questionnaire was developed to collect primary data from employees and managers in sachet water manufacturing firms. The questionnaire included both closed-ended and Likert-scale questions to measure perceptions of ethical procurement practices and operational efficiency. Questionnaires were administered through Google Forms, a widely used method for collecting data in academic research, particularly in quantitative studies. Google Forms was selected as the data collection tool due to its cost-effectiveness, ease of distribution, and real-time data aggregation (Ha, 2022). As a free, user-friendly platform, it eliminates the need for expensive survey software or printing costs associated with paper-based surveys, making it particularly suitable for studies with limited financial and logistical resources. However, beyond its financial benefits, Google Forms also supports standardized data collection, response validation features, and anonymous participation, which collectively enhance data consistency and respondent honesty.

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Surveys are a cost-effective and efficient way of gathering large amounts of standardized data from participants (Karunarathna *et al.,* 2024). They allow researchers to quantify responses and analyze relationships between variables using statistical techniques. The target population consists of employees and managers working in sachet water manufacturing firms. A total of 170 respondents participated in the study. Sachet water manufacturing firms were chosen as the population because they face significant environmental challenges, such as plastic waste management, making them ideal for studying the impact of sustainable procurement practices on operational efficiency. Convenient sampling was used to select participants based on the accessibility of respondents and time constraints. While convenience sampling may introduce bias, it is often used in exploratory studies where random sampling is impractical (Emerson, 2021). The relatively large sample size (170 respondents) helps mitigate potential biases and ensures sufficient data for analysis.

Descriptive statistics (e.g., mean, standard deviation, frequency distribution) were used to summarize the demographic characteristics of respondents and the distribution of responses. Descriptive statistics provide a clear overview of the sample and highlight key trends in the data (Alabi and Bukola, 2023). This step lays the foundation for more advanced analyses. Cronbach's Alpha was calculated to assess the internal consistency of the survey instrument. Reliability analysis ensures that the survey items consistently measure the intended constructs. High reliability enhances the credibility of the study's findings (Bang, 2024). The Kaiser-Meyer-Olkin (KMO) measure and Bartlett's Test of Sphericity were conducted to evaluate the suitability of the data for factor analysis (Eze *et al.,* 2021). This validity checks ensure that the data is appropriate for further statistical analyses, such as factor analysis and regression. This step strengthens the robustness of the study. Pearson correlation was used to assess the strength and direction of the relationship between ethical procurement practices and operational efficiency. Pearson correlation identifies whether ethical procurement practices significantly influence operational efficiency or not.

This analysis supports hypothesis testing and informs subsequent regression models. Collinearity diagnostics, including Variance Inflation Factor (VIF) and tolerance values, were conducted to detect multicollinearity among independent variables. Collinearity statistics ensure that independent variables are not highly correlated, which could distort regression results. This step enhances the accuracy of the regression analysis. Regression analysis was performed to predict operational performance based on ethical procurement practices. Regression analysis quantifies the impact of ethical procurement practices on operational efficiency, providing empirical evidence to test the hypotheses (Israel *et al.,* 2019). This step is critical for drawing conclusions and making recommendations. A Normal Probability-Probability (P-P) plot was constructed to assess the normality of residuals for the dependent variable (operational performance). Normality of residuals is a key assumption in regression analysis. The Normal P-P plot ensures that the data meets this assumption, enhancing the validity of the regression results. The combination of reliability and validity checks ensures the quality of the data. Statistical techniques like regression analysis and correlation provide actionable insights into the impact of ethical procurement on operational efficiency.

RESULT AND DISCUSSION

This comprehensive analysis undertakes a detailed examination of the descriptive statistics related to the various factors that significantly influence sustainable procurement practices and their consequential effects on the performance of supply chains. The data scrutinizes two crucial

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dimensions: ethical procurement (EP) and operational efficiency (OP). Table 1 provides a detailed summary of the descriptive statistics for the study, offering insights into the central tendencies, variability, and distribution of responses for each variable. These statistics include measures such as mean, standard deviation, skewness, and kurtosis for each construct.

Table 1: Descriptive Statistics

Variables	N	Min	Max	Mean	Std.Dev	Skewness	Kurtosis
EP	170	1	5	3.748	1.007	-0.654	-0.181
OP	170	1	5	3.837	0.918	-1.003	0.103

Source: Field Data, 2025

The mean score for Ethical Procurement (EP) of 3.748, as shown in Table 1, indicates that respondents generally perceive ethical procurement practices positively, leaning toward agreement on the Likert scale. This means sachet water manufacturing firms' positive perception of ethical procurement (e.g., as a way to reduce costs, improve reputation, and ensure long-term viability) strengthens their intention to adopt sustainable procurement practices. For example, firms sourcing materials from suppliers using renewable energy or minimizing plastic waste were seen as gaining economic and reputational advantages, reinforcing a positive behavioral attitude. Standard Deviation (Std. Dev.): 1.007 indicates moderate variability in responses, suggesting that while most respondents agree with ethical procurement practices, there are some differing perspectives (Ndung'u, 2022). The negative skewness, -0.654, indicates that responses are slightly skewed toward higher values (positive evaluation). The negative kurtosis, -0.181, suggests a flatter distribution compared to a normal curve, indicating diversity in opinions. The positive mean score suggests that respondents generally hold favorable attitudes toward ethical procurement, which aligns with the Theory of Planned Behavior's (TPB) premise that attitudes influence behavioral intentions (Conner & Armitage, 1998). Ethical procurement likely resonates with personal values, encouraging intentions to adopt such practices.

Respondents perceive operational performance positively (OP): 3.837, suggesting that sustainable procurement practices contribute to supply chain efficiency. The moderate variability of standard deviation (Std. Dev.): 0.918, indicates some differences in how organizations experience operational benefits. This moderate variation reflects differing levels of awareness, experience, or organizational capacity regarding sustainability in procurement. Highly negative skewness (-1.003) reflects a strong trend toward higher scores. The highly negative skewness (-1.003) observed in the variable Operational Performance (OP) indicates that the distribution of responses is heavily concentrated toward the higher end of the scale - meaning that respondents, on average, evaluated operational performance very positively. In simple terms, most respondents reported strong agreement that sustainable procurement practices, particularly ethical procurement, have a positive impact on supply chain efficiency and organizational performance.

According to TPB, the combination of positive attitudes, strong subjective norms, and high Perceived Behavior Control (PBC) leads to strong behavioral intentions, which then translate into actual behavior (Setijanto *et al.,* 2019). For example, strong subjective norms increase the likelihood of forming a positive intention to implement ethical practices, which translates into actual behaviors. The high scores and negative skewness in OP suggest that these normative

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pressures are successfully influencing real-world changes in procurement strategies that boost performance. Slightly positive kurtosis (0.103) suggests a slightly peaked distribution, indicating clustering around higher scores. The positive mean score reflects favorable attitudes toward the operational benefits of sustainable procurement, reinforcing intentions to adopt such practices. This aligns with TPB's prediction that strong attitudes foster behavioral intentions. Al-Mamary & Alraja 2022). The variables exhibit mean scores above 3.687, indicating overall positive perceptions of sustainable procurement practices and their impact on supply chain efficiency. Operational performance (OP) has the highest mean (3.837), highlighting its central role in driving sustainability and efficiency. Across the two variables, attitudes are generally positive, supporting TPB's assertion that favorable attitudes drive intentions. OP shows greater consensus, while EP exhibits more diversity. OP aligns most closely with the Theory of Planned Behavior, showing strong attitudes, consensus, and perceived control. Therefore, ethical procurement (EP) exhibits positive attitudes but faces variability and perceived barriers. The reliability statistics presented in Table 2 indicate a Cronbach's Alpha for the items that have been intricately included in the research instrument.

Table 2: Reliability Analysis (Cronbach's Alpha)

Items	No of items	Cronbach's Alpha
Independent variables:		
Ethical Procurement	5	0.833
Dependent variables:		
Operational Performance	5	0.865

Source: Field Data, 2025

Cronbach's alpha values range from 0.833 to 0.865, indicating that all constructs exhibit high internal consistency in Table 2. A value above 0.7 is generally considered acceptable for research purposes, and all variables in this study exceed this threshold. Ethical Procurement (EP) with Cronbach's Alpha: 0.833 indicates high internal consistency, suggesting that the five items measuring ethical procurement are well-aligned and reliably capture the construct. Operational Performance (OP) with Cronbach's Alpha: 0.865, suggesting high internal consistency, confirming that the items measuring operational performance (e.g., cost efficiency, lead time reduction) are reliable (Bhutto & Shaikh, 2024).

Table 3 provides a detailed validity check for the study, specifically focusing on two key statistical measures: the Kaiser-Meyer-Olkin (KMO) and Bartlett's Test of Sphericity. These tests are essential for ensuring that the data collected is suitable for factor analysis, which is often used to validate the construct structure in studies involving multiple variables. KMO measures whether the sample size is adequate for conducting factor analysis. It evaluates the strength of relationships between variables, with values closer to 1 indicating better suitability (Shrestha, 2021). Bartlett's Test of Sphericity tests the hypothesis that the correlation matrix is an identity matrix (i.e., no significant correlations exist between variables). A significant result ($p < 0.05$) confirms that the variables are sufficiently interrelated for factor analysis. These tests ensure that the constructs used in the study are valid and reliable, providing confidence in the results.

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Table 3: Validity Check (KMO and Bartlett's Test)

Items	Coefficient
Kaiser-Meyer-Olkin Measure of Sampling Adequacy	0.916
Bartlett's Test of Sphericity: Approx:	
Chi-Square	3213.428
Df	300
Sig.	0.000

Source: Field Data, 2025

A KMO value of 0.916 indicates excellent sampling adequacy, meaning the sample size is sufficient and the variables are highly correlated. This suggests that the data is suitable for factor analysis. Bartlett's test examines whether the correlation matrix is an identity matrix (indicating no significant relationships between variables). A p-value (Sig.) of 0.000 (less than 0.05) indicates that the null hypothesis (no significant correlations) is rejected (Vaidyanathan, 2023). This means there are sufficient correlations between variables to justify factor analysis. The variables provided in Table 4 offer critical insights into the relationships between sustainable procurement practices and supply chain efficiency, as measured by operational performance (OP). Table 4 presents the Pearson correlation coefficients between operational performance (OP) and other variables, including sustainable procurement practices (ethical procurement (EP)), firm characteristics (firm size, firm age, number of suppliers, procurement budget, technology adoption level).

Table 4: Pearson Correlation (Operational Performance as Dependent Variable)

Variables	1	2	3	4	5	6	7	8	9
OP	1								
EP	0.486	0.545	0.578	1					
Firmsize	0.484	0.523	0.548	0.634	1				
Firmage	0.325	0.545	0.414	0.314	0.340	1			
No of supp	0.401	0.493	0.493	0.425	0.466	0.481	1		
Proc. Bud	0.416	0.595	0.595	0.486	0.349	0.546	0.346	1	
T. adopt Lev	0.284	0.437	0.320	0.320	0.104	0.442	0.239	0.752	1

Source: Field Data, 2025

Table 4 shows that operational performance (OP) has the highest correlation (1.0). This shows that engaging ethical procurement initiatives significantly enhances operational efficiency, such as cost reduction, lead time optimization, and inventory management. This indicates the strongest correlation, which means Ethical Procurement (EP) (0.578) has strong positive correlations with OP, suggesting that ethically responsible procurement practices contribute to supply chain efficiency. Firm Characteristics: Firm Size (0.484) and Procurement Budget (0.416) exhibit moderate correlations, implying that larger firms with higher budgets are better equipped to implement sustainable procurement practices, leading to improved operational performance. Technology adoption level (0.284) shows the weakest correlation, indicating that while technology

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adoption supports efficiency, its impact is less pronounced compared to procurement practices. Table 5 provides tolerance and variance inflation factor (VIF) values for all predictor variables, assessing multicollinearity in the regression models.

Table 5: Collinearity Statistics

Items	Tolerance	VIF
EP	0.241	4.149
Firmsize	0.493	2.027
Firmage	0.568	1.761
No of supp	0.625	1.600
Proc. Bud	0.298	3.359
T. adopt Lev	0.364	2.746

Source: Field Data, 2025

VIF values range from 1.600 to 4.149, with all values below the threshold of 10, indicating no severe multicollinearity issues. However, variables like EP (4.149) and Procurement Budget (3.359) have relatively high VIFs, suggesting some degree of collinearity. Table 6 presents the results of multiple regression analysis, predicting operational performance (OP) based on sustainable procurement practices and firm characteristics.

Table 6: Regression Analysis Predicting Operational Performance

Predictor Variables	Unstd Coeff. (B)	Std Coeff. (β)	t-value	Sig.
Constant	0.829	-	3.059	0.003
EP	0.107	0.117	1.036	0.001
Firmsize	0.012	0.016	0.201	0.002
Firmage	0.030	0.037	0.500	0.841
No of supp	0.063	0.079	1.129	0.618
Proc. Bud	0.012	0.017	0.171	0.865
T. adopt Lev	-0.017	-0.026	-0.282	0.004
R	**0.710**			
R^2	**0.504**			
Adjusted R^2	**0.480**			
F statistic	**20.484**			
Sig (Anova)	**0.001**			
Dubin Watson	**1.527**			

Source: Field Data, 2025

Ethical Procurement (EP) ($\beta = 0.117$, $p < 0.001$) significantly contributes to operational efficiency. Variables like firm age, number of suppliers, and procurement budget show no significant effects

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on OP, suggesting that these factors may not directly influence operational efficiency. Model Fit: $R^2 = 0.504$, indicating that the model explains 50.4% of the variance in operational performance. With regards to age, older firms may have entrenched, traditional procurement systems that are not necessarily aligned with modern efficiency metrics. In contrast, younger firms may be more agile in adopting ethical sourcing strategies, but this agility may not be captured solely by firm age. The sheer number of suppliers may not directly translate to better performance. Instead, supplier quality, collaboration, and ethical compliance (captured under EP) are more critical for operational outcomes. Also, having too many suppliers can introduce coordination challenges, duplication, and inconsistent quality, which may negatively offset any potential benefits of diversification.

A higher procurement budget does not guarantee better performance if funds are not allocated ethically or strategically. Inefficient or unethical spending can lead to increased costs and waste. The study suggests that how resources are used (i.e., ethical sourcing) is more important than how much is spent, a key insight for cost-sensitive industries like sachet water manufacturing. A 50.4% explained variance indicates that the model captures a meaningful portion of the factors influencing operational efficiency, particularly through the inclusion of Ethical Procurement as a strong predictor. This is a moderate-to-strong fit, suggesting that the predictors effectively capture the factors influencing OP. The remaining ~50% unexplained variance suggests that other variables not included in the model, such as management practices, technology adoption, employee training, or market dynamics, also play a role in shaping operational performance. In the sachet water industry, where cost, speed, and compliance are critical, ethical procurement serves as a proxy for strategic resource optimization, which is why it emerges as a significant predictor even when other firm characteristics are not.

Figure 1 shows a normal P-P plot for operational performance (OP). The points on the plot generally align closely with the diagonal reference line, especially in the middle range of probabilities. There is some minor deviation at the tails (extreme ends), where the points slightly deviate from the diagonal line. The close alignment of points with the diagonal line suggests that the residuals for operational performance (OP) are approximately normally distributed. Minor deviations at the tails are common in real-world data and may not significantly affect the validity of the regression results. However, they could indicate slight non-normality or outliers in the data.

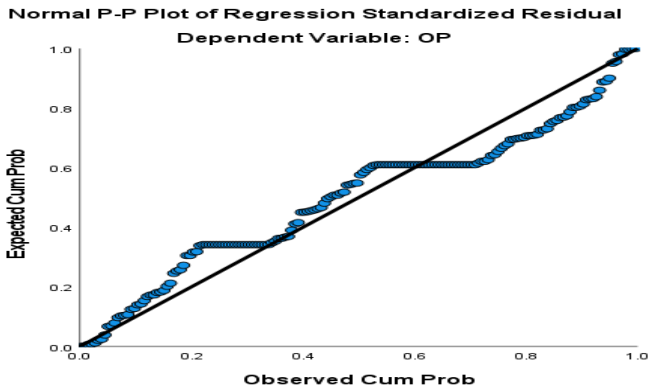

Figure 1: Normal P-P Plot for Operational Performance (OP).

Source: Field Data, 2025

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SUMMARY OF FINDINGS

Table 1 provides valuable insights into how respondents perceive sustainable procurement practices and their impact on supply chain efficiency. The descriptive statistics reveal generally positive perceptions, with EP being practiced. These findings strengthen the study's ability to draw meaningful conclusions and provide actionable recommendations for both researchers and practitioners. Cronbach's alpha values range from 0.819 to 0.919, indicating that all constructs exhibit high internal consistency in Table 2. A value above 0.7 is generally considered acceptable for research purposes, and the two main variables in this study exceed this threshold. Ethical Procurement (EP) with Cronbach's Alpha: 0.833 indicates high internal consistency, suggesting that the five items measuring ethical procurement are well-aligned and reliably capture the construct. The implications of this finding meant that ethical procurement practices, such as fair trade and anti-corruption measures, are consistently understood and implemented across respondents. This ensures that the data collected on this variable is reliable for further analysis. Operational Performance (OP) with Cronbach's Alpha: 0.865 suggests high internal consistency, confirming that the items measuring operational performance (e.g., cost efficiency, lead time reduction) are reliable. This high reliability ensures that the study can accurately assess how sustainable procurement practices influence operational efficiency.

A KMO value of 0.916 indicates excellent sampling adequacy, meaning the sample size is sufficient and the variables are highly correlated. This suggests that the data is suitable for factor analysis. The high KMO value reinforces the reliability of the constructs identified in Table 3 (e.g., ethical procurement, operational performance). Researchers can confidently proceed with further analyses, such as exploratory factor analysis (EFA), to validate the measurement model. Bartlett's test examines whether the correlation matrix is an identity matrix (indicating no significant relationships between variables). A p-value (Sig.) of 0.000 (less than 0.05) indicates that the null hypothesis (no significant correlations) is rejected. This means there are sufficient correlations between variables to justify factor analysis. This significantly confirms that the variables included in the study are interrelated and appropriate for further statistical analysis. This supports the construct validity of the study, ensuring that the items within each construct (e.g., ethical procurement) effectively measure the intended underlying concept. Combined KMO and Bartlett's test results provide strong evidence of construct validity, which researchers can confidently proceed with inferential analyses (e.g., regression analysis) to examine the relationships between sustainable procurement practices and supply chain efficiency.

The variables provided in Table 4 offer critical insights into the relationships between sustainable procurement practices and supply chain efficiency, as measured by operational performance (OP). This table presents the Pearson correlation coefficients between operational performance (OP) and other variables, including sustainable procurement practices, ethical procurement (EP), and firm characteristics (firm size, firm age, number of suppliers, procurement budget, and technology). Ethical procurement practices play significant roles, reinforcing the need for organizations to integrate sustainability into their procurement strategies. Table 5 provides tolerance and variance inflation factor (VIF) values for all predictor variables, assessing multicollinearity in the regression models. While multicollinearity is not a major concern, researchers should interpret the regression coefficients cautiously, particularly for variables with higher VIFs, as they may share overlapping variance with other predictors. Table 6 presents the results of multiple regression analysis,

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predicting operational performance (OP) based on sustainable procurement practices and firm characteristics. The assumption of normality for residuals is reasonably satisfied for the regression model predicting operational performance (OP). This supports the reliability of the findings related to the predictors of operational efficiency, Ethical Procurement (EP). Normal P-P Plot for Operational Performance (OP) is shown in Figure 1. The points on the plot generally align closely with the diagonal reference line, especially in the middle range of probabilities. There is some minor deviation at the tails (extreme ends), where the points slightly deviate from the diagonal line. The close alignment of points with the diagonal line suggests that the residuals for Operational Performance (OP) are approximately normally distributed. Minor deviations at the tails are common in real-world data and may not significantly affect the validity of the regression results. Organizations should focus on ethical procurement to improve operational efficiency. The non-significant predictors highlight areas where additional research may be needed to identify other potential drivers of efficiency.

PRACTICAL IMPLICATION

The findings underscore the importance of integrating sustainable procurement practices into organizational strategies. Ethical procurement demonstrates consistent alignment with sustainability goals, while operational performance highlights the tangible benefits of these practices. Organizations can use these insights to improve efficiency, reduce costs, and achieve long-term sustainability objectives. The study provides robust evidence of the positive impact of sustainable procurement practices on supply chain efficiency through ethical procurement. The study recommends the development and implementation of sustainable procurement policies that prioritize environmentally friendly materials, fair labor practices, and supplier accountability. Create supplier scorecards that include ethical, environmental, and social performance indicators to guide procurement decisions. Last, build strategic relationships with ethical suppliers to ensure consistent quality, timely delivery, and cost efficiency. By prioritizing these practices, firms can enhance their operations, contributing to a more sustainable and resilient supply chain. The study successfully validates the reliability and validity of its constructs, providing a strong basis for examining the impact of sustainable procurement practices on supply chain efficiency. By building on these findings to drive meaningful advancements in sustainability and operational efficiency, firms can meet their sustainable targets. This not only contributes to academic knowledge but also supports the transition toward more sustainable and resilient supply chains.

RESEARCH IMPLICATION

The high KMO value and significant Bartlett's test confirm that the study's measurement model is valid and reliable. This strengthens the credibility of findings related to the impact of sustainable procurement practices (e.g., ethical procurement) on supply chain efficiency (operational performance). The reliability analysis confirms that the measurement scales are robust and suitable for addressing the research objectives.

THEORETICAL IMPLICATION

The study on the effect of sustainable procurement practices on supply chain efficiency in Ghanaian SMEs carries several significant theoretical implications. The research extends the current body of knowledge on sustainable procurement by focusing specifically on sachet water manufacturing firms, a sector that has been underexplored compared to large corporations. This

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provides new insights into how sustainable procurement practices can be effectively implemented in smaller organizations. The high reliability and validity of constructs such as ethical procurement and operational performance (as evidenced by Cronbach's alpha values and KMO/Bartlett's test results) reinforce the robustness of these theoretical constructs. This validation supports their use in future studies and strengthens the theoretical foundation for examining sustainable procurement practices. The study applies the Theory of Planned Behavior (TPB) to understand the influence of attitudes, subjective norms, and perceived behavioral control on sustainable procurement practices. Findings confirm that attitudes (positive perception of EP) and subjective norms (stakeholder pressure) strongly predict OP, extending TPB application to procurement practices in SMEs.

FUTURE RESEARCH DIRECTION

While the current study provides valuable insights into the impact of sustainable procurement practices on supply chain efficiency, several areas remain unexplored or warrant further investigation. The current study captures cross-sectional data, which may not fully reflect the sustained impacts of practices like EP. A longitudinal approach could reveal how these practices evolve and their cumulative effects on operational efficiency. How do sustainable procurement practices influence supply chain resilience during disruptions (e.g., pandemics, geopolitical tensions)? What are the long-term financial returns from investing in green technologies or ethical sourcing?

Compare sustainable procurement practices across different cultural and geographic contexts. The current study's sample reflects regional biases, and cultural differences could influence perceptions and implementations of sustainability. Cross-cultural comparisons would provide a more comprehensive understanding of these practices. How do cultural values and regulatory environments shape sustainable procurement practices in developed versus developing countries? What lessons can be learned from regions with advanced sustainability frameworks (e.g., Europe) and applied to emerging markets? Further investigate the relationships between predictors with higher Variance Inflation Factor (VIF) values. While multicollinearity is not a major concern in the current study, variables with higher VIFs may share overlapping variance.

Future research could refine the measurement model and clarify the independent contributions of each predictor. How do overlapping variables (e.g., firm size and procurement budget) interact to influence supply chain efficiency? Can alternative modeling techniques (e.g., structural equation modeling) better capture complex relationships? The findings of this study lay a strong foundation for understanding the impact of sustainable procurement practices on supply chain efficiency. However, numerous opportunities exist for future research to deepen our understanding of these dynamics. By exploring longitudinal effects and cross-cultural comparisons, researchers can uncover new insights and develop actionable strategies for organizations. These efforts will not only advance academic knowledge but also support the global transition toward more sustainable and resilient supply chains.

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