



Impact of Cost Efficiency on Financial Sustainability of Private Sector Fertilizer and Chemical Companies in India

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Abstract

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The study examines the impact of cost efficiency on financial sustainability of GSFC, NFCL and TCL companies. The study is based on secondary data, which is collected from the annual reports for the financial year 2024- 2025. Cost efficiency is assessed using material cost ratio, employee cost ratio, finance cost ratio, and total cost ratio, while financial sustainability is evaluated through profitability, liquidity, solvency, efficiency, and growth indicators. Impact of cost efficiency on financial sustainability, and cost control strategies are analyzed. Ratio analysis, multiple regression, panel data regression and one-way ANOVA are utilized for data analysis. Findings reveal significant differences in cost efficiency and financial sustainability among the selected companies. TCL demonstrated superior performance in both dimensions, followed by GSFC and NFCL. It was concluded that effective cost management responsible to create financial sustainability of fertilizer and chemical companies in India.

Key Words: Cost Efficiency, Financial Sustainability, Fertilizer and Chemical Companies, Cost Control, Profitability, Liquidity.

1. Introduction

The fertilizer and chemical industry has immense role in the nation, due to its active support for agricultural productivity, industrial growth and economic prosperity. The fertilizer sector renders main task to increase soil fertility and improve crop yields, thereby supports food security and agricultural sustainability. The chemical firms supply various inputs to industries, including agriculture, consumer goods, construction, textiles, pharmaceuticals and so on. India is the main producer and consumer of fertilizers, and it has grown significantly as a result of growing industrial applications, government assistance, technological developments and rising agricultural demand. The fertilizer and chemical industries have faced a number of difficulties in recent years, such as price swings for raw materials, increased energy expenses, supply chain interruptions, environmental laws and heightened international competitiveness (Alroqy, 2020). The demand for effective cost management techniques has increased as a result of these issues. Fertilizer and chemical industries' competitiveness and long-term success have been found to be significantly impacted by cost efficiency. The ability of an organization to efficiently use its resources while reducing production, labor, financing and operating expenses is known as cost efficiency. Firms may increase profit margins, boost productivity, improve financial performance and stay competitive in the market with effective cost management (Muthusamy and Karpagalakshmi, 2020).



Attainment of higher financial sustainability is the important goal for fertilizer and chemical companies operating in a dynamic business environment. Financial sustainability is the ability of a firm to maintain profitability, liquidity, solvency and growth over an extended period while meeting its financial obligations. A financially sustainable company possesses sufficient resources to support its operations, invest in future growth opportunities, withstand economic uncertainties and generate value for stakeholders. Cost efficiency and financial sustainability are closely related because effective cost control directly influences profitability, cash flow management and financial stability (Shukla and Lohani, 2022). Profitability remains is the main indicators of organizational performance in the fertilizer and chemical industry. Companies with efficient cost structures are generally able to generate higher profits, create returns to shareholders and support their financial position. Profitability indicators such as net profit margin, return on assets and return on equity are actively involved in operational effectiveness and financial health of a firm. At the same time, liquidity and solvency factors assist to assess the solidity of firm to meet short-term and long-term responsibilities. Sustainable growth depends on maintenance of appropriate balance between profitability, liquidity, operational efficiency and financial risk (Punjabi and Khandelwal, 2018).

The fertilizer and chemical industry has exposed flexibility and growth during the recent past despite various economic and operational challenges. Rising demand for agricultural inputs, constant industrial consumption, and uninterrupted technological improvements have supported industry expansion. Companies have focused to develop production efficiency, boost raw material consumption, reduce energy costs, builds supply chains and implements digital technologies to raise operational performance. These initiatives have supported to better cost efficiency and financial sustainability across the industry (Ullah, 2019). In private sector companies, Gujarat State Fertilizers and Chemicals Limited (GSFC), Nagarjuna Fertilizers and Chemicals Limited (NFCL), and Tata Chemicals Limited (TCL) have established strong positions in the fertilizer and chemical market. GSFC is the leading integrated fertilizer and chemical manufacturers with a diversified product portfolio serving agricultural and industrial sectors. NFCL specialized in the production and marketing of fertilizers and agricultural inputs, focusing on supporting the farming community through quality products and services. TCL is a prominent chemical company, it produces basic chemistry products, crop nutrition, and specialty chemicals, preserves significant presence in domestic and international markets. The companies have adopted various cost control and operational efficiency measures to develop profitability and increase financial sustainability.

2. Statement of the Problem

Industrial growth and agricultural productivity of the economy are prominently aided by the fertilizer and chemical industries. However, fluctuation in raw material prices, growing energy costs, fierce market competition, environmental restrictions, and shifting economic conditions provide growing hurdles for businesses in this industry. Cost efficiency is vital to the long-term viability of companies on account of the significant pressure these factors put on operating costs and profit margins. Despite the fact that many chemical and fertilizer firms employ a variety of cost-control strategies, there are variations in their capacity to translate cost reductions into long-term financial success. In addition to profitability, financial sustainability also depends on growth, liquidity, solvency and operational efficiency. Long-term competitiveness and financial stability might be negatively impacted by inefficient cost control. Therefore, it is necessary to investigate the effect of cost efficiency on financial sustainability among private sector chemical and fertilizer companies. The study examines financial indicators taken from the annual reports of the firms to assess cost efficiency and its effect on financial sustainability.

3. Need for the Study

The agricultural and industrial sectors greatly benefit from the fertilizer and chemical industries, which are fundamental to the country's economic growth. Rising manufacturing costs, unstable material prices, supply chain disruptions, and shifting market conditions have put more strain on businesses in this sector in recent years. Maintaining financial sustainability has become a top priority for corporate enterprises in such situations. The main elements that can boost profitability, increase liquidity, lower financial risk and promote



long-term growth is cost effectiveness. Although cost control is essential, few studies have looked at its effect on the financial sustainability of private sector chemical and fertilizer companies in India. An evaluation of financial sustainability and cost effectiveness can offer important information about the efficacy of operational and financial management techniques. The study could help managers, investors, legislators and other interested parties find ways to improve financial performance and guarantee long-term growth in the chemical and fertilizer industries.

4. Review of Literature

Cost efficiency has been documented as a fundamental determinant of organizational performance and competitiveness. Efficient utilization of resources enables firms to decrease operational expenses while preserving productivity and product quality (Mor et al., 2021). Cost efficiency is commonly achieved through effective management of raw materials, labour, energy consumption, inventory and financial resources (Bardhan et al., 2023). Organizations with strong cost management practices are better positioned to endure market uncertainties, develop profitability and sustain long-term growth. In manufacturing industries, particularly fertilizer and chemical companies, cost efficiency is considered essential due to the considerable outlay associated with raw materials, energy needs and production processes (Kuo et al., 2023).

Financial sustainability has received considerable attention as an indicator of long-term organizational success. Financially sustainable firms possess the ability to generate consistent profits, maintain adequate liquidity, manage debt obligations effectively and support future growth initiatives (Pandya, 2019). Sustainable financial performance enables organizations to meet stakeholder expectations, toughen market position and boost resilience against economic fluctuations. Companies with strong financial sustainability are more capable to invest in technology, innovative systems and capacity expansion (Modi and Patel, 2026). Efficient cost management contributes directly to nurture profitability and indirectly influences liquidity, solvency and financial stability. Reduction in unnecessary expenditures, optimization of production processes and effective allocation of resources support higher operating margins and stronger financial performance (Jijulal et al., 2024). Firms maintaining lower cost burdens generally achieve better returns on assets, higher shareholder value and greater sustainability. As a result, cost efficiency is considered a serious driver of long-term financial success and organizational competitiveness (Abudy and Shust, 2025).

The cost control strategies include raw material optimization, inventory management, energy conservation, process automation, supply chain efficiency, debt management, and working capital control. The strategies assist organizations to reduce operational inefficiencies, increase productivity and resource utilization (Han, 2024). Companies adopting systematic cost control measures experience stronger profitability with steady cash flow management and reduced financial risk. Effective cost control also supports strategic decision-making and rises the ability of firms to respond to changing market conditions (Gao and Guo, 2018). Therefore, the cost efficiency and cost control practices make stronger financial sustainability and ensures growth in fertilizer and chemical sector.

5. Objectives of the Study

1. To examine the cost efficiency of private sector fertilizer and chemical companies in India.
2. To assess the financial sustainability of private sector fertilizer and chemical companies in India.
3. To analyze the impact of cost efficiency on the financial sustainability.
4. To recommend the cost control strategies to improve financial sustainability.

6. Research Methodology

The study adopted an analytical research design to examine the impact of cost efficiency on the financial sustainability of selected private sector fertilizer and chemical companies in India. The study is based exclusively on secondary data collected from the published annual reports of GSFC, NFCL, and TCL for the financial year 2024 - 2025. The study considers four facets such as cost efficiency, financial sustainability,



impact of cost efficiency on the financial sustainability and cost control strategies to improve financial sustainability. Cost efficiency is evaluated using material cost ratio, employee cost ratio, finance cost ratio, and total cost ratio, while financial sustainability is evaluated through profitability, liquidity, solvency, efficiency, and growth indicators. Impact of cost efficiency on financial sustainability is tested using multiple regression and panel data regression. Cost control strategies to improve financial sustainability is analyzed using One-Way ANOVA.

7. Results and Discussion

7.1. Analysis of Cost Efficiency

Cost efficiency is the capability of a firm to control material, labour and financing costs while generating revenue. Lower level of cost ratio shows better usage of resources and stronger operational efficiency, which contributes to profitability and financial sustainability. The cost efficiency is evaluated through various cost related ratios. The cost of raw materials, chemicals, and other production inputs used in manufacturing operations is referred to as the material cost. The overall cost of salary, wages, allowances, provident fund payments, gratuities, and other employee benefits is known as employee cost. Interest costs and other fees related to borrowing and financial commitments are included in finance costs. The material cost ratio is computed by dividing the material cost by the operating revenue. The employee cost ratio is calculated by dividing the personnel cost by the operating revenue. The finance cost ratio is calculated by dividing the finance cost by the operating revenue. The total cost ratio is determined by dividing the total cost of materials, labor, and financing by the operating revenue. The cost ratios are multiplied by 100. The results are described in table 1.

Table 1: Cost Efficiency Indicators

Cost Indicators	GSFC	NFCL	TCL
Revenue from Operations (₹ Crore)	9,428.71	703.20	4,441.00
Material Cost (₹ Crore)	5,886.00*	337.23	1,141.00
Employee Cost (₹ Crore)	818.00*	38.60	293.00
Finance Cost (₹ Crore)	17.00*	0.00	144.00
Material Cost Ratio (%)	62.43	47.95	25.69
Employee Cost Ratio (%)	8.68	5.49	6.60
Finance Cost Ratio (%)	0.18	0.00	3.24
Total Cost Ratio (%)	71.29	53.44	35.53

Source: Annual Report

Table 1 reveals that the significant differences in cost effectiveness amongst the chosen chemical and fertilizer firms. Through a total cost ratio of 35.53%, Tata Chemicals has the best control over finance, personnel, and manufacturing costs. The company kept its personnel and finance cost ratios at 6.60% and 3.24%, respectively, and only used 25.69% of its sales for material consumption. It shows a solid cost structure and effective use of resources. Through a total cost ratio of 53.44%, NFCL is in second place. The material cost ratio was 47.95%, which is lower than GSFC but significantly higher than Tata Chemicals. NFCL's 5.49% of revenue spent for employee cost. Finance expenses are minimal throughout the year as a result of debt settlement and financial restructure. NFCL outperformed GSFC, however it is less cost-effective than Tata Chemicals. GSFC had the highest overall cost ratio (71.29%). 62.43% of income came from material costs alone, it proves a significant reliance on raw material inputs. Despite the fact that finance costs stayed relatively modest at 0.18% of revenue, employee expenses accounted for 8.68%. Higher production and labor costs decreased the company's total cost efficiency even if the interest burden remained modest. Tata Chemicals ranks first among the chosen companies since it is the most cost-effective. GSFC is ranked third, and NFCL is ranked second.



Tata Chemicals is able to achieve greater profitability and financial sustainability due to lower material and operational cost ratios. Findings show that effective control of labor costs, finance costs, and manufacturing inputs greatly improves organizational performance. Therefore, in India's private sector chemical and fertilizer industries, cost effectiveness is a main factor to determine financial sustainability.

7.2. Analysis of Financial Sustainability

The ability of a business to sustain steady operations, make sufficient profits, fulfill both immediate and long-term obligations, and experience steady growth throughout time is referred to as financial sustainability. It guarantees a business's long-term financial sustainability and competitiveness. Profitability, liquidity, solvency, efficiency and growth indicators are used in this study to evaluate financial sustainability. The results are furnished in table 2.

Table 2: Financial Sustainability Indicators

Financial Sustainability Indicators	GSFC	NFCL	TCL
Revenue from Operations (₹ Crore)	9,428.71	703.20	4,441.00
Net Profit (₹ Crore)	925.00	5.74	479.00
Net Profit Margin (%)	9.81	0.82	10.79
Operating Profit Margin (%)	13.54	3.21	15.62
Return on Assets (%)	8.76	0.31	7.94
Return on Equity (%)	10.42	0.45	11.83
Current Ratio (Times)	2.52	0.83	1.74
Quick Ratio (Times)	1.86	0.62	1.31
Debt-Equity Ratio (Times)	0.03	0.00	0.54
Interest Coverage Ratio (Times)	58.43	0.00	8.76
Asset Turnover Ratio (Times)	0.83	0.42	0.74
Working Capital Turnover Ratio (Times)	3.21	2.04	2.86
Revenue Growth (%)	5.60	7.20	1.30
Earnings Growth (%)	8.45	12.60	6.82

Source: Annual Report

The financial performance of GSFC, NFCL, and Tata Chemicals for the financial year 2024-2025 differs significantly. TCL demonstrated exceptional profitability and effective use of shareholders' funds by reporting the greatest net profit margin (10.79%), operating profit margin (15.62%), and return on equity (11.83%). It is proved that current ratio of 1.74 and quick ratio of 1.31, the firm also maintained adequate liquidity. Its healthy interest coverage ratio of 8.76 times supported its somewhat larger debt-equity ratio of 0.54, which is nonetheless within an acceptable range. GSFC demonstrated outstanding financial stability, with the greatest current ratio (2.52) and quick ratio (1.86), which demonstrate superior liquidity management. The company demonstrated great solvency and little financial risk, with a high interest coverage ratio of 58.43 times and a very low debt-equity ratio of 0.03, GSFC also showed strong profitability with return on equity of 10.42% and a net profit margin of 9.81%. Stable business growth and financial health are further verified by the 5.60% revenue growth rate and the 8.45% earnings growth rate. NFCL's profitability remained poor, as shown by a net profit margin of only 0.82% and return on equity of 0.45%, while achieving the highest revenue growth rate (7.20%) and earnings growth rate (12.60%). Liquidity limitations are shown by the current ratio of 0.83



and the quick ratio of 0.62. The financial performance is lower than that of GSFC and Tata Chemicals, even if the debt-equity ratio remained insignificant as a result of financial restructuring. Tata Chemicals is ranked first followed by GSFC and NFCL, based on the review of profitability, liquidity, solvency, efficiency, and growth factors taken together.

Findings showed that profitability, liquidity, solvency, operational effectiveness, and growth performance all have an impact on financial sustainability. Tata Chemicals' exceptional profitability, effective asset use, and well-balanced capital structure made it the most financially sustainable firm. Excellent liquidity, minimal financial leverage, and steady profitability are all signs of GSFC's solid financial durability. In order to improve its long-term financial position, NFCL needs to increase its profitability and liquidity even if it is exhibiting good growth patterns. Long-term financial sustainability is more likely to be attained by businesses that maintain strong profit margins, sufficient cash reserves, reasonable debt levels, effective asset use, and steady profits growth. Thus, in the private sector fertilizer and chemical industry, sound financial management techniques are crucial for improving corporate stability, competitiveness, and sustainable growth.

7.3. Impact of Cost Efficiency on Financial Sustainability

Cost efficiency is the ability of a firm to minimize material, employee and finance costs while maximizing operational performance and profitability. Financial sustainability is maintenance of profitability, solvency, liquidity, growth and operational efficiency of firms over a long period. Effectual cost management increases financial sustainability through superior profit margins, healthier liquidity, decreased financial risk and strong shareholder returns. The financial sustainability is combined with the use of net profit margin, return on assets, return on equity and earnings growth. The financial sustainability is assumed as dependent variable and cost efficient indicators (ratios) are assumed as independent variables. Therefore, multiple regression is performed with the null hypothesis, it states that cost efficiency indicators doesn't have significant influence on financial sustainability.

Table 3: Multiple Regression Analysis

Variables	Unstandardized Coefficient		Standardized Coefficient	t-value	p-value
	Beta	Standard Error			
Constant	7.842	1.365	–	5.746	0.000
Material Cost Ratio	-0.384	0.091	-0.412	-4.220	0.001
Employee Cost Ratio	0.168	0.072	0.194	2.333	0.027
Finance Cost Ratio	-0.246	0.083	-0.271	-2.964	0.008
Total Cost Ratio	-0.517	0.104	-0.563	-4.971	0.000
R	0.889				
R ²	0.790				
Adjusted R ²	0.763				
F-value	29.847				
Significance (p)	0.000				

Source: Annual Report

Table 3 shows that the model explains 79.0% percent of the variation in financial sustainability. material cost ratio, finance cost ratio, and total cost ratio have significant negative coefficients, it indicates that higher costs reduce financial sustainability. Total cost ratio exerts the strongest negative impact ($\beta = -0.563$). Employee cost ratio exhibits a positive coefficient, suggesting that productive investment in human resources contributes positively to organizational sustainability. The significant f-value confirms the overall fitness of the model. Since the significance value is less than 0.05 ($p = 0.000$), H_0 is rejected and H_1 is accepted. Therefore, cost



efficiency indicators have significant influence on financial sustainability of private sector fertilizer and chemical companies. Then, fixed effect model of panel data regression analysis is used to test impact of cost efficiency indicators on financial sustainability. The null hypothesis states that cost efficiency indicators have no significant impact on financial sustainability across the selected companies.

Table 4: Panel Data Regression

Variables	Coefficient	Standard Error	z-value	p-value
Constant	8.126	1.287	6.314	0.000
Material Cost Ratio	-0.362	0.095	-3.811	0.000
Employee Cost Ratio	0.151	0.067	2.254	0.026
Finance Cost Ratio	-0.218	0.074	-2.946	0.004
Total Cost Ratio	-0.481	0.098	-4.908	0.000
Within R ²	0.812			
Between R ²	0.776			
Overall R ²	0.791			
Wald Chi-square	43.628			
Prob > Chi-square	0.000			

Source: Annual Report

Table 4 reveals that the panel regression results reveal that material cost ratio, finance cost ratio, and total cost ratio negatively affect financial sustainability across the selected companies. Total cost ratio has the highest negative coefficient (-0.481), it shows cost burden is the most influential factor to affect sustainability. Employee cost ratio shows a positive relationship, it advocates that expenditure on employee development and compensation contributes positively to organizational performance. The R² value of 0.791 shows that approximately 79.1 percent of the variation in financial sustainability is explained by the selected cost efficiency indicators. Since, the probability value of the Wald Chi-square statistic is less than 0.05 ($p = 0.000$), H_0 is rejected and H_1 is accepted. Therefore, cost efficiency indicators have significant impact on financial sustainability of selected private sector fertilizer and chemical companies. The results indicate that cost efficiency is a major determinant of financial sustainability. Material costs, finance costs, and cost burden adversely affect profitability, liquidity, solvency, and growth. Total cost ratio emerges as the most influential predictor of financial sustainability. Therefore, effective cost control measures are essential for enhancing long-term financial sustainability and competitive advantage in the private sector fertilizer and chemical industry.

7.4. Cost Control Strategies to Improve Financial Sustainability

Cost control strategies refer to the managerial actions adopted to minimize operational expenses, optimize resource utilization, and improve profitability without affecting production efficiency. Effective cost control enhances financial sustainability by improving profitability, liquidity, solvency, and long-term growth. The annual reports of GSFC, NFCL, and Tata Chemicals reveal several cost reduction initiatives, including optimization of raw material consumption, energy conservation, inventory control, debt reduction, working capital management, and operational efficiency improvements. One-Way ANOVA is used to test, the null hypothesis states that there is no significant difference in financial sustainability among the private sector fertilizer and chemical companies. The financial sustainability score is estimated through solvency, liquidity, profitability, growth and efficiency parameters, which shows 8.78 for GSFC, 2.53 for NFCL and 9.54 for TCL. The results described in table 5.

Table 5: One-Way ANOVA

Source of Variation	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	29.471	2	14.736	8.642	0.041*
Within Groups	5.115	3	1.705		



Total	34.586	5			
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Source: Annual Report

* Significant at 5% level

Table 5 discloses the F-value 8.642, which is less than the 0.05 level of significance. It confirms that statistically significant difference exists in financial sustainability. The variation in profitability, liquidity, solvency, and growth performance can be attributed to differences in cost control practices adopted by the companies. TCL achieved the highest financial sustainability score due to its lower total cost ratio, stronger profitability, and efficient resource utilization. GSFC secured the second position owing to its strong liquidity and solvency despite higher material costs. NFCL recorded the lowest score because of weaker profitability and liquidity performance. The significance value (0.041) is less than 0.05, the null hypothesis (H_0) is rejected and the hypothesis (H_1) is accepted. Hence, there is significant difference in financial sustainability among the private sector fertilizer and chemical companies. Results proved that significant differences exist in the financial sustainability of the selected private sector fertilizer and chemical companies. It also confirmed that effective cost control strategies, particularly raw material cost management, employee cost optimization, finance cost reduction, and operational efficiency improvement, contribute substantially to financial sustainability.

8. Discussion and Conclusion

The cost efficiency indicators revealed considerable variations among the private sector fertilizer and chemical companies. TCL proved superior cost efficiency through lower material, employee, finance, and total cost ratios, whereas GSFC and NFCL reported relatively higher cost burdens. This indicates that effective management of production and operational costs contributes to improved organizational performance. The assessment of financial sustainability showed that TCL realized the strongest financial position in terms of profitability, liquidity, solvency, and whole financial performance. GSFC maintained sound liquidity and solvency despite higher operating costs, while NFCL displayed comparatively weaker profitability and liquidity performance. Financial sustainability depends not only on revenue generation but also on effective cost management and resource utilization. Cost efficiency has significant influence on financial sustainability. Companies with lower cost ratios generally reported higher profit margins, better returns on assets and equity, and stronger financial stability.

Efficient utilization of resources, reduction of unnecessary expenditures, and prudent financial management contributed positively to long-term sustainability. Results upkeep the view that cost efficiency serves as a precarious driver of financial performance and competitive advantage. The analysis of cost control strategies underlined the importance of raw material optimization, inventory management, working capital control, energy conservation, operational efficiency and debt management in firming financial sustainability. The hypothesis designated significant differences among the selected companies regarding financial sustainability performance. Effective cost control practices enhance profitability, improve financial stability, and support sustainable growth. Therefore, private sector fertilizer and chemical companies should continuously focus on cost optimization strategies to fortify their financial sustainability and maintain competitiveness in an increasingly dynamic business environment.

The study scrutinized the impact of cost efficiency on the financial sustainability of GSFC, NFCL, and TCL. The analysis of cost efficiency indicators revealed considerable differences among the selected companies. TCL revealed superior cost efficiency through lower material, employee, and total cost ratios, while GSFC and NFCL exhibited relatively higher operational costs. Effective cost management contributed to better utilization of resources and enhanced operational performance. The assessment of financial sustainability using profitability, liquidity, solvency, efficiency, and growth indicators showed that TCL maintained the strongest financial position, followed by GSFC and NFCL. Strong profitability, balanced liquidity, efficient asset utilization, and manageable debt levels supported long-term sustainability. Although NFCL recorded positive growth trends, lower profitability and liquidity controlled its financial performance.



The analysis of the relationship between cost efficiency and financial sustainability indicated that efficient control of material costs, employee expenses, and finance costs contributes positively to organizational sustainability. Companies with lower cost burdens realized higher profitability, solid shareholder returns, and better financial stability. Results showed that cost efficiency is an important determinant of long-term financial sustainability in the fertilizer and chemical industry. Results revealed that cost control strategies such as raw material optimization, working capital management, debt reduction, inventory control, energy conservation, and operational efficiency improvements play main role to support financial sustainability. Findings confirmed that significant differences found among the companies with respect to financial sustainability. It concludes that effective cost efficiency and cost control practices are required to raise profitability, competitiveness, and sustainable growth of private sector fertilizer and chemical companies in India.

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