



Original Article

A STUDY OF THE PROBLEM OF SUPPLY CHAIN MANAGEMENT OF FERTILIZER INDUSTRY IN PANDHARPUR TEHSIL

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Abstract:

AI The fertilizer industry plays a crucial role in the agricultural economy of India, as it directly influences crop productivity, food security, and farmers' income. Efficient supply chain management is essential for ensuring the timely availability of fertilizers to farmers at affordable prices, particularly in agriculturally dependent regions like Pandharpur Tehsil. This study focuses on the problems of supply chain management in the fertilizer industry operating in Pandharpur Tehsil, where agriculture remains the primary occupation and fertilizer demand is seasonal and highly sensitive to monsoon conditions.

The research examines the entire fertilizer supply chain, including procurement of raw materials, manufacturing, transportation, storage, distribution, and retail delivery to farmers. Special attention is given to identifying operational, logistical, financial, and administrative challenges faced by fertilizer companies, distributors, wholesalers, and retailers in the study area. Issues such as delayed supply, inadequate storage facilities, transportation bottlenecks, high distribution costs, fluctuating demand, dependency on government subsidies, and inefficient inventory management are critically analysed. The study also highlights problems related to poor coordination among supply chain participants, lack of real-time information sharing, and limited use of modern supply chain technologies.

Primary data for the study is collected through structured questionnaires and personal interviews with fertilizer dealers, distributors, transporters, and farmers in Pandharpur Tehsil, while secondary data is sourced from government reports, industry publications, and previous research studies. Analytical tools such as percentage analysis, charts, and simple statistical techniques are used to interpret the data.

The findings of the study reveal that ineffective supply chain management leads to frequent fertilizer shortages during peak agricultural seasons, increased operational costs, and dissatisfaction among farmers. The study emphasizes the need for improved logistics planning, better coordination among stakeholders, adoption of digital supply chain systems, and supportive government policies. The research concludes that strengthening supply chain efficiency can significantly enhance fertilizer availability, reduce costs, and contribute to sustainable agricultural development in Pandharpur Tehsil.

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Introduction:

The fertilizer industry plays a vital role in India's agricultural sector, providing essential nutrients for crop growth and productivity. Effective

supply chain management is crucial for ensuring the timely and efficient delivery of fertilizers to farmers. Pandharpur Tehsil, located in the Solapur district of Maharashtra, to farmers. Pandharpur Tehsil, located



in the Solapur district of Maharashtra, is an agriculturally prominent region that relies heavily on fertilizers for its crops. This study aims to investigate the supply chain management practices of the fertilizer industry in Pandharpur Tehsil, identifying challenges, opportunities, and areas for improvement. Agriculture remains the backbone of the Indian economy, especially in rural areas, and the productivity of agricultural land hinges critically on the timely and effective supply of inputs-among which fertilizers play a pivotal role. Pandharpur Tehsil, in the Solapur district of Maharashtra, is an agriculturally important region, with a variety of crops like sugarcane, grains, pulses, oilseeds, and horticultural produce. Given the dependency of crop yield on soil fertility and nutrient management, fertilizers are essential. However, the benefits of fertilizers can be undermined if the supply chain-which involves sourcing raw materials, manufacture, transportation, storage, distribution, and retailing-is inefficient or not well coordinated. Supply chain management (SCM) in the fertilizer industry refers to the set of processes, actors, and flows (materials, information, finance) that enable fertilizers to move from producers or importers to distributors and ultimately to the farmers. Key challenges often include delays, spoilage, storage losses, high logistics cost, regulatory constraints, pricing volatility, and mismatch between supply and farmers' demand both in quantities and in type (e.g. nitrogenous, phosphatic, potassic fertilizers, micronutrients).

Objective Of Study:

The primary objectives of this study are: -

1. To investigate the current supply chain management practices in the fertilizer industry in Pandharpur Tehsil.
2. To identify the challenges and opportunities in the supply chain management of fertilizers in

Pandharpur Tehsil.

3. To explore potential solutions and strategies for improving supply chain efficiency and effectiveness.
4. To assess the roles of transportation, intermediaries, and input suppliers in the supply process.
5. To provide recommendations for improving supply chain merger and reducing operational challenges.

Scope of the study:

1.geogrphical scope: - Pandharpur tehsil Solapur district Maharashtra. **the** study covers the entire Pandharpur tehsil encompassing rural and semi urban areas where agriculture is a primary occupation. The study is limited to Pandharpur Tehsil in Solapur District, Maharashtra, which is a predominantly agricultural area with high fertilizer consumption.

2.industry scope: - focus on fertilizer manufactures, distributors, wholesalers and retailers operating in the region. This study focuses solely on the fertilizer industry, including major fertilizer types such as Urea, DAP, NPK, and organic fertilizers.

3. Time Frame: - The study will observe the fertilizer supply chain during one agricultural cycle (Kharif or Rabi season), to capture peak demand conditions.

4.Stakeholder Scope: - The study involves stakeholders such as: -

1. Government and private fertilizer distributors
2. Retail shop owners
3. Transport and logistics providers
4. Local farmers and agricultural cooperatives.

5. Functional Scope: - It will analyze areas such as: -1. Inventory management 2. Logistics and transportation 3. Demand forecasting 4. Information flow and communication among stakeholders 5. Use of technology in Supply Chain Management.



This scope ensures the study remains practical, region-specific, and focused on identifying actionable recommendations that can improve fertilizer availability and distribution in the tehsil.

Limitation of the study:

1. The study focuses only on Pandharpur tehsil and findings may not be applicable to other regions.
2. Data collection limited to available wholesalers and suppliers willing to participate some entities may be excluded.
3. Seasonal variations in fertilizer demand may affect supply chain dynamics but are not fully covered.
4. The study does not cover the entire upstream raw material supply or downstream impact on farming productivity.
5. Limited access to proprietary business information affecting the depth of analysis.
6. **Limited Time Frame:** - The study is conducted within a short span (e.g., 2-3 months), which may not capture seasonal variations in fertilizer demand and supply (especially pre-monsoon and kharif seasons).
7. **Snapshot Nature:** - The findings represent the supply chain status during a particular period, which may not reflect long-term trends or disruptions (e.g., droughts, policy changes).
8. **Time Constraints for Field Work:** - Due to limited time for field visits and stakeholder interviews, the depth of primary data collected may be restricted.
9. **Lack of Longitudinal Analysis:** - Time limitations prevent a year-round or multi-year analysis that could provide more comprehensive insights into supply chain dynamics.

Research Methodology:

The study aims to analyze and understand the current supply chain management practices in the fertilizer industry within Pandharpur tehsil,

identifying strengths, gaps, and areas of improvement.

A. Methods of Research: - This research will adopt a mixed-method approach:

1. Quantitative Research: - Together numerical data regarding production, transportation, inventory levels, distribution, sales, etc.

2. Qualitative Research: - To understand managerial practices, challenges, and perceptions of key stakeholders (farmers, distributors, retailers).

This combination ensures both statistical accuracy and contextual understanding of the supply chain operations.

B. Sample Design Population: - Fertilizer manufacturers, wholesalers, retailers, transporters and farmers in Pandharpur tehsil.

Sampling Technique: Stratified random sampling to ensure representation from each level of the supply chain.

Sample Size: -

- * 5 Manufacturers/Distributors
- * 10 Retailers
- * 30 Farmers
- * 5 Transport agents/logistics partners

(Sample size may vary based on data availability)

This design ensures a balanced representation of the key actors in the fertilizer supply chain.

C. Research Design: -

This study will follow a descriptive research design, aiming to systematically describe:

- Current supply chain processes
- Key actors and their roles
- Challenges faced (seasonal demand, logistics, pricing, etc.)
- Gaps and inefficiencies
- Recommendations for improvement

This design is suitable for mapping existing structures and analyzing operational performance.



D. Method of Data Collection: -

1. Primary Data Collection: -

Structured Questionnaires for retailers, distributors, and farmers

Interviews with supply chain managers and transporters

Field Visits to observe warehousing, logistics, and retail setups

2. Secondary Data Collection: -

Company records and annual reports (where available)

Government publications (agricultural & fertilizer departments)

Research papers, journals, and market reports

Online databases and statistical reports

This comprehensive data collection method ensures the reliability and depth of the study.

Review of Literature:

1. Christopher, M. (2016) – *Logistics and Supply Chain Management*

Christopher emphasized that supply chain management involves coordination among suppliers, manufacturers, distributors, and retailers to achieve efficiency and customer satisfaction. He highlighted that poor supply chain integration, inadequate planning, and lack of technology adoption are primary causes of operational inefficiencies in industries including agriculture inputs like fertilizers. The study suggested that real-time inventory management and improved transportation networks are key to reducing delays and shortages.

2. Gummesson, E. (2017) – *Supply Chain Challenges in Agricultural Industry*

This study explored the problems faced by agricultural input industries in rural areas. It found that seasonal demand fluctuations, delayed procurement of raw materials, and logistical bottlenecks lead to supply shortages

during peak farming seasons. Effective communication and coordination between manufacturers, distributors, and retailers are necessary for a smoother supply chain.

3. Sharma, R., & Singh, P. (2018) – *Fertilizer Supply Chain in India: Issues and Opportunities*

This research focused specifically on fertilizer distribution in India and identified key challenges including transportation delays, inadequate storage facilities, and dependency on government subsidies. The study concluded that modernization of supply chains through digital tracking, forecasting tools, and better infrastructure is crucial for improving fertilizer availability to farmers.

4. Chopra, S., & Meindl, P. (2019) – *Supply Chain Management: Strategy, Planning & Operation*

Chopra and Meindl emphasized the importance of supply chain visibility and coordination. They pointed out that industries like fertilizers face issues in inventory management, distribution planning, and responsiveness to demand changes. They recommended implementing Enterprise Resource Planning (ERP) systems and predictive analytics to optimize the supply chain.

5. Kumar, A., & Bansal, S. (2020) – *Challenges in Rural Supply Chains*

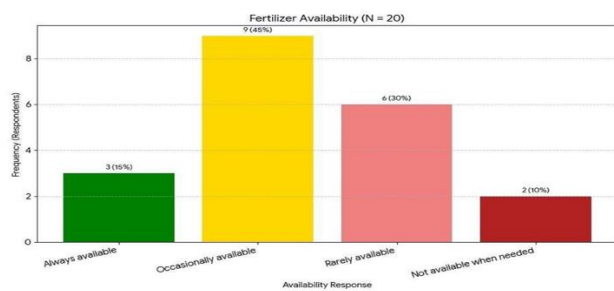
This study analysed supply chain issues in rural India, including fertilizer and seed distribution. It found that transportation difficulties, inadequate infrastructure, lack of trained personnel, and fragmented distribution networks create inefficiencies. The study suggested collaboration among government agencies, private companies, and local dealers to improve supply chain performance.



Data and Interpretation:

Table No: 1 Fertilizer Availability – Table

Sr. No.	Response Option	Frequency	Percentage (%)
1	Always available	3	15%
2	Occasionally available	9	45%
3	Rarely available	6	30%
4	Not available when needed	2	10%
Total	—	20	100%



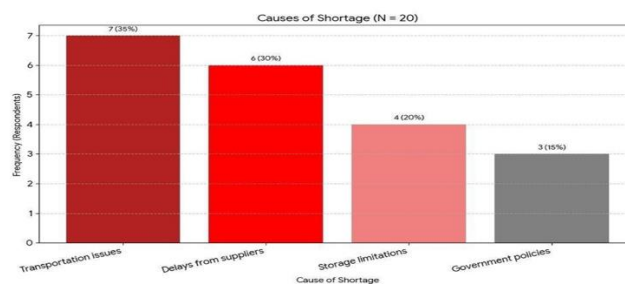
The data reveals that inconsistent availability is the main experience for the customers, with a strong majority not having fertilizers readily available when needed. The largest segment is Occasionally available, accounting for 45% (9 out of 20) of the responses. This indicates a significant issue with supply reliability. Combining the negative responses (Occasionally available, rarely available, and not available when needed) shows that 85 % (17 respondents) experience some degree of difficulty or inconsistency in obtaining fertilizer. Rarely available accounts for a substantial 30 % (6 respondents). The most negative category, not available when needed, is 10 % (2 respondents).

Only a small minority of 15% (3 respondents) reported that fertilizer is Always available.

Table no. 2 Causes of

Fertilizer Shortage

Sr. No.	Cause of Shortage	Frequency	Percentage (%)
1	Transportation issues	7	35%
2	Storage limitations	4	20%
3	Delays from suppliers	6	30%
4	Government policies	3	15%
Total	—	20	100%

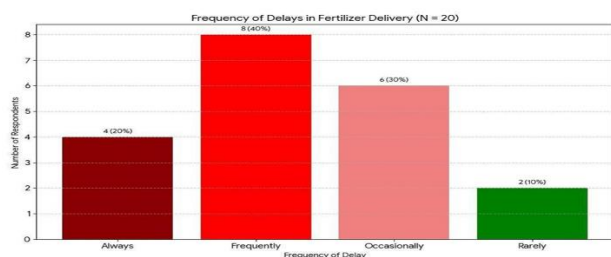


The data indicates that the core causes of shortages are related to logistics and supplier management, with Transportation issues and Delays from suppliers being the most frequently cited problems. Transportation issues are the single largest contributing factor, accounting for 35 % (7 out of 20) of the responses. This highlights significant challenges in the movement and delivery of goods. Delays from suppliers is the second major cause at 30% (6 respondents). Combined with transportation issues, external supply chain factors account for 65 % of the reported shortages. Storage limitations represent 20 % (4 respondents), indicating that internal capacity or management of stock is also a contributing factor. Government policies are the least cited cause at 15% (3 respondents).



Table no. 3 Delays in Fertilizer Delivery

Sr. No.	Response Option	Frequency	Percentage (%)
1	Always	4	20%
2	Frequently	8	40%
3	Occasionally	6	30%
4	Rarely	2	10%
Total	—	20	100%



The data shows that delays in fertilizer delivery are a significant and common problem for the vast majority of the customers. A massive 90% (18 out of 20) of respondents reported experiencing delays either Always, Frequently, or Occasionally. This indicates a severe systemic issue in the logistics or scheduling process. The largest segment is Frequently, accounting for 40% (8 respondents). Combining the most severe categories, always (20%) and Frequently (40%), shows that 60% of customers experience delays at least often, if not every time. Occasionally reports account for another large portion at 30%. Only a tiny minority of 10% (2 respondents) experience delays Rarely.

Table no. 4 Role in Fertilizer Distribution

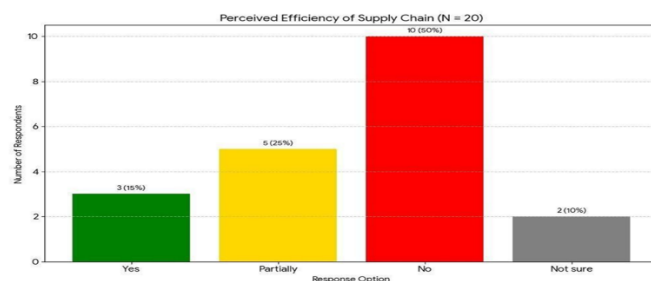
Sr. No.	Role	Frequency	Percentage (%)
1	Manufacturer	5	25%
2	Distributor	8	40%
3	Retailer	5	25%
4	Government	2	10%
Total	—	20	100%



The data highlights the central importance of Distributors and Retailers/Manufacturers in the fertilizer supply chain, with the largest share of issues being attributed to the intermediate supply roles. The Distributor role is cited as the most frequent source of issues, accounting for the highest share at 40% (8 out of 20) of the responses. This suggests that the wholesale and regional logistics phase is the primary bottleneck. Manufacturer and Retailer roles share the next largest proportion, each accounting for 25% (5 respondents each). Combined, they represent 50% of the responses, indicating that problems originate almost equally at the production/source level and the final point of sale. The Government role is cited as the least frequent source of issues, accounting for 10% (2 respondents).

Table no. 5 Efficiency of Supply Chain

Sr. No.	Response Option	Frequency	Percentage (%)
1	Yes	3	15%
2	No	10	50%
3	Partially	5	25%
4	Not sure	2	10%
Total	—	20	100%



The data reveals a strong consensus that the supply chain is not efficient, with a majority of customers expressing dissatisfaction or doubt regarding its performance. A clear majority of 50% (10 out of 20 respondents) explicitly stated "No" to



the supply chain being efficient. This is the single largest and most concerning finding, indicating fundamental issues in the system. When combined with those who felt the chain was Partially efficient (25 % or 5 respondents), only 25 % of the customer base reports a positive or full efficiency. Only a small minority of 15 % (3 respondents) believe the supply chain is fully "Yes" (efficient).

The Not sure category accounts for 10 % (2 respondents), suggesting a lack of transparency or consistency that prevents a clear positive judgment.

Findings:

1. **Inconsistent Fertilizer Availability:** The study reveals that fertilizer availability in Pandharpur Tehsil is largely inconsistent. A significant majority of respondents (85%) reported that fertilizers are only occasionally available, rarely available, or not available when needed. Only 15% of respondents stated that fertilizers are always available. This indicates serious supply reliability issues, especially during peak agricultural seasons when demand is high.
2. **Logistics as the Main Cause of Shortage:** Transportation issues (35%) and delays from suppliers (30%) together account for 65% of the fertilizer shortages. This highlights that logistical inefficiencies and poor coordination with suppliers are the dominant problems in the supply chain. Storage limitations (20%) further worsen the situation, while government policies (15%) play a relatively smaller but notable role.
3. **Frequent Delays in Fertilizer Delivery:** Delivery delays are a major concern, with 90% of respondents experiencing delays either always, frequently, or occasionally. A combined 60% face delays on a regular basis (always or frequently), indicating systemic weaknesses in scheduling, transport management, and distribution planning.

4. **Distributors as the Major Bottleneck:** Distributors are identified as the most critical weak link in the supply chain, accounting for 40% of the issues. Manufacturers and retailers each account for 25%, suggesting problems at both production and retail levels. Government-related issues are least cited (10%), indicating that operational inefficiencies outweigh policy-related problems.
5. **Overall Inefficiency of the Supply Chain;** Half of the respondents (50%) believe that the fertilizer supply chain is not efficient at all, while only 15% consider it efficient. The remaining respondents either see it as partially efficient or are unsure, reflecting dissatisfaction, lack of transparency, and poor coordination across the supply chain.

Suggestions:

1. **Strengthening Transportation and Logistics Infrastructure:** Since transportation issues are the leading cause of shortages, improving road connectivity, ensuring timely vehicle availability, and optimizing delivery routes can significantly enhance fertilizer movement and reduce delays.
2. **Improved Coordination with Suppliers:** Fertilizer manufacturers and suppliers should adopt better demand forecasting and scheduling systems to ensure timely dispatch. Stronger coordination between suppliers, distributors, and retailers is essential to avoid delays during peak seasons.
3. **Enhancement of Storage Facilities:** Adequate warehouse and storage infrastructure should be developed at distributor and retailer levels to maintain



buffer stock, especially before the sowing season, to prevent sudden shortages.

4. Use of Digital Supply Chain Management

Systems: Adoption of digital tools such as inventory tracking systems, real-time stock updates, and demand forecasting software can improve transparency, efficiency, and decision-making across the supply chain.

5. Improved Role of Distributors: Since distributors are identified as the major bottleneck, their operational efficiency should be improved through better training, performance monitoring, and accountability mechanisms.

Conclusion:

The present study concludes that supply chain management in the fertilizer industry of Pandharpur Tehsil faces significant operational and logistical challenges that directly affect fertilizer availability and timely delivery to farmers. The findings clearly indicate that inconsistent availability of fertilizers is a major concern, with a large majority of respondents experiencing occasional or frequent shortages. This situation

adversely impacts agricultural activities, especially during critical sowing and cultivation periods.

The study reveals that transportation issues and delays from suppliers are the primary causes of fertilizer shortages, highlighting inefficiencies in logistics planning and coordination among supply chain participants. Inadequate storage facilities further aggravate the problem by limiting the ability to maintain sufficient buffer stock. Frequent delays in fertilizer delivery reflect weaknesses in scheduling, route management, and distribution control. Among the various stakeholders, distributors emerge as the most critical bottleneck in the supply chain, indicating the need for improved management and accountability at the intermediary level.

Overall, the fertilizer supply chain in Pandharpur Tehsil is perceived as inefficient by a majority of respondents, suggesting a lack of integration, transparency, and responsiveness within the system. These inefficiencies not only increase operational costs but also lead to dissatisfaction among farmers and retailers, ultimately affecting agricultural productivity and rural economic stability.