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"A Study on Efficiency of Transportation and Distribution Network in Enhancing Operational Performance of Aavin"

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Abstract-- This article synthesizes the findings from the project "A study on efficiency of transportation and distribution network in enhancing the operational performance of Aavin" conducted in Coimbatore District. The research evaluates procurement consistency, cold-chain performance, route planning, and causes of delivery delays using primary data collected from employees, transport staff, distributors and retailers. Statistical tools such as Chi-square, ANOVA and Spearman correlation were applied. The analysis identifies inconsistent temperature maintenance, scheduling inefficiencies and vehicle breakdowns as key operational challenges and proposes targeted techno-managerial solutions.

I. Introduction

The dairy sector depends critically on robust transportation and distribution systems because milk is highly perishable. Aavin (Tamil Nadu Co-operative Milk Producers' Federation) operates a wide procurement and distribution network across Coimbatore district. This study assesses how collection, chilling, transport and last-mile distribution affect throughput, product quality, costs and farmer/consumer satisfaction, and suggests improvements to strengthen the cold chain and reduce losses.

The project scope and methodology are based on field surveys, company records, and stakeholder interviews.

II. Objectives

1. To evaluate Aavin's current transportation and distribution strategies and their impact on operational performance.
2. To assess customer satisfaction and cold-chain performance with respect to delivery timeliness and product condition.

III. Research Methodology

A descriptive research design was adopted. Primary data were collected using a structured questionnaire and interviews from 51 respondents across procurement, transport, chilling units and retail outlets. Secondary sources included Aavin reports and literature on dairy logistics. Data were analyzed using percentage analysis, Chi-square, ANOVA, and Spearman's correlation where appropriate.

Analysis 1: Milk Procurement Target Achievement

Table 1:
Milk procurement target achievement (n = 50)

Procurement Status	Percentage	No. of Responses
Always meets or exceeds target	24%	12
Mostly meets	24%	12
Meets sometimes	26%	13
Often below	18%	9
Frequently fails	8%	4

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Interpretation:

The results show mixed procurement performance — about 48% of respondents indicate that Aavin usually meets or exceeds procurement targets (Always/Mostly), while 52% report inconsistent achievement (Meets sometimes/Often below/Frequently fails).

This uneven procurement performance can create variability in factory input and complicate distribution planning, requiring improved forecasting and local-level coordination to stabilise milk inflows.

Analysis 2: Temperature Maintenance During Transport

Table 2:
Temperature maintenance during transport to BMCs/retail (n = 51)

Temperature Maintenance	Percentage	No. of Responses
Consistently maintained	17.6%	9
Mostly maintained (70–99%)	27.5%	14
Occasionally maintained (50–70%)	27.5%	14
Rarely maintained (≈50%)	15.7%	8
Never maintained	11.8%	6

Interpretation:

Only about 45.1% of shipments report consistent or mostly maintained temperatures; the rest face occasional to frequent cold-chain lapses. Nearly 38% reported transport durations exceeding four hours with poor temperature control (per project findings), which risks spoilage and quality variation across outlets. The data indicate urgent need for IoT temperature monitoring, preventive maintenance and route/time optimization to shorten transit times.

Analysis 3: Primary Causes of Delivery Delays

Table 3:
Primary causes of delays (multiple responses allowed, n ≈ 51)

Cause of Delay	Percentage	No. of Responses
Traffic congestion / poor route planning	56.9%	29
Delays at chilling/loading points	47.1%	24
Vehicle breakdowns / scheduling failures	43.1%	22
Staffing shortages / late arrival	37.3%	19
Coordination gaps (procurement-logistics)	23.5%	12

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Interpretation:

The dominant causes are traffic/route planning and process delays at loading points; internal factors such as vehicle breakdowns and staffing also contribute significantly. With inefficient dispatch scheduling reported by 54.9% in related tables and maintenance issues at 49%, the evidence points to both planning and asset-reliability gaps. Targeted measures — scheduling, route optimization, and preventive maintenance — will reduce these bottlenecks.

IV. Additional Statistical Insights

Chi-square, ANOVA and Spearman correlation tests were applied in the project. For example, Chi-square independence tests returned non-significant p-values for certain opinion pairs (e.g., Pearson $\chi^2 = 21.292$, df = 20, p = 0.380), suggesting independence for those variables; Spearman's rho between procurement consistency and distribution quality was weak and non-significant ($\rho = -0.193$, p = 0.174). ANOVA tests comparing group means (e.g., ratings across groups) were likewise non-significant in many cases, indicating broadly similar perceptions across respondent categories. These outcomes are reported and interpreted in the project dataset.

V. Findings

1. Procurement is inconsistent: roughly half the sample reports irregular target achievement, complicating supply continuity.
2. Cold-chain reliability is patchy: less than half shipments maintain recommended temperatures consistently, creating risk for product quality.
3. Operational delays are driven more by internal scheduling and maintenance issues than by external traffic alone — scheduling/driver assignment and vehicle breakdowns are top causes.
4. Overall customer satisfaction is relatively high (≈82% satisfied/highly satisfied with delivery and communication in many tables), but service consistency varies across routes and units.

VI. Suggestions

- Implement route optimization and dynamic scheduling (GPS + traffic-aware routing) to reduce transit time and inconsistencies.
- Deploy IoT temperature sensors with centralized dashboards and automated alerts for every tanker and BMC.
- Institute preventive maintenance schedules and digital logs for vehicles to minimise breakdowns.
- Strengthen coordination between procurement, chilling and dispatch through mobile apps and shared KPIs; introduce performance incentives for timely collections.
- Pilot BMC/IoT installations and evaluate ROI; expand where measurable gains in freshness and reduced complaints are observed.

VII. Conclusion

The project demonstrates that Aavin Coimbatore has a functioning procurement-distribution system with strong pockets of performance, yet faces critical bottlenecks in cold-chain reliability, scheduling and fleet maintenance. Implementing focused digital solutions and operational reforms will reduce losses, stabilise supply and improve farmer and consumer outcomes. The article above is prepared from the project document and its tables, analyses and recommendations.

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