Optimization of Sales Strategy and Order Forecasting in a Dairy Business

A MID TERM report for the BDM capstone Project

Submitted by :

Name: Aman Kumar Rawat
Roll number: 23f2001035

IITM Online BS Degree Program,
Indian Institute of Technology, Madras,
Chennai Tamil Nadu, India, 600036

Contents:

Declaration Statement

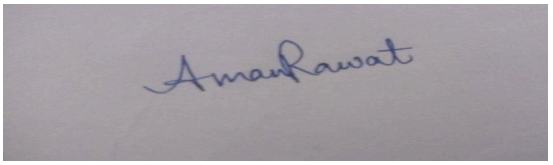
I am currently undertaking a project titled “Optimization of Sales Strategy and Order Forecasting in a Dairy Business for Naadul Milk.” I extend my sincere gratitude to Mr. Rajesh Kumar Singh (Managing Director – Naadul Milk) for his support and for providing access to the necessary data and resources that have enabled the progress made thus far in this project.

I hereby declare that the data presented and analyzed in this mid-term report is authentic and accurate to the best of my knowledge and abilities. The information has been sourced primarily through direct access to business records and has been carefully cleaned and structured to ensure reliability for analysis.

I further affirm that all processes related to data collection, cleaning, and descriptive analysis have been transparently documented in this report. The insights and interpretations provided reflect the current stage of analysis and represent a genuine outcome of the methodologies applied up to this point.

I remain committed to the principles of academic honesty and integrity. This project is being conducted independently, without collaboration with other individuals, and any deviation or instance of plagiarism will be subject to appropriate academic scrutiny and disciplinary action if found.

Lastly, I acknowledge that the observations and recommendations made in this report are specific to this project and context alone, and cannot be generalized or used elsewhere under the endorsement of IIT Madras.



Signature of Candidate : (Digital Signature)

Name: Aman Kumar Rawat

Executive Summary and Title :

Naadul Milk, a dairy business, caters to both B2B and B2C markets through a diverse product portfolio—ranging from cream, milk, and paneer to dahi and ghee. While the company has a strong presence in bulk and retail segments, it currently faces challenges in understanding category-wise sales performance, product-level demand trends, and revenue variability. These gaps hinder strategic decisions on pricing, inventory, and profitability optimization.

To address this, two datasets were curated: Sales Data (848 transactions from April–May 2025) and a Rate and margin List. The Sales Data records daily transactions with details such as item, quantity, unit, price, and total revenue. The Rate and margin List defines product-level attributes like MRP, packaging size,landed amount, billing amount, profit margin and unit conversions, enabling price validation and standardization. Together, they offer a structured foundation for reliable time-series and product-wise analytics.

Descriptive statistics revealed ₹1.88 crore in total revenue across 33 products, with cream products contributing the highest average revenue per transaction. Standard deviation and range metrics exposed sharp variability in high-volume items like cream and fresh milk, whereas products like "Fresh Dahi Matka" showed consistent, low-volume sales. These insights reflect key consumption and pricing dynamics across segments.

So far, data cleaning, metadata design, and exploratory analysis have been completed. These findings will drive the next phase: forecasting B2B order patterns and optimizing product mix to support profitability, pricing, and strategic growth for Naadul Milk.

2.Proof of Data Originality

To establish the credibility and authenticity of the dataset used, this section includes verifiable evidence such as the cleaned dataset link, a signed authorization letter from the business, relevant images of the servicescape, and a short video interaction with the quality control Manager of Naadul Milk.
These materials confirm that the data has been sourced directly from internal records and is not secondary or publicly available, ensuring that the analysis and findings presented in this report are original, reliable, and context-specific.

1.Link to Cleaned Dataset: **cleaned sales Naadul.xlsx**

2.Company's Location: (https://maps.app.goo.gl/Cmu2WnX4aPqBfwAZ7)

3.Link of Interaction Video and the Transcript :

Video: **Interaction Video.mp4**

Transcript: **Transcript of the Interaction Video.pdf**

4.Link of All the photos, Letter of Organisation : **Proof Of Originality**

Some Photos clicked during the site visit with the Quality Control Manager of Naadul Milk.

Letter From Organisation

LETTER FROM ORGANISATION:

NAADUL MILK
Beniram Katra Chauraha,
BASUHAR, KAUSHAMBI ,
UTTAR PRADESH, 212216

To Whom It May Concern,

This letter serves to confirm that Mr. Aman Kumar Rawat Enrollment No: 23f2001035 , a student of the Bachelor of Science (BS) program at IIT Madras, approached our establishment as part of his academic project.

He is currently undertaking a capstone project under the Business Data Management (BDM) Project, which involves interacting with real-world business entities to collect and analyze operational data for academic research purposes.

We acknowledge that Mr.Aman Kumar Rawat has requested access to certain business data from our organization. We understand that this information will be used solely for educational purposes and will not be shared outside the scope of his project or disclosed to third parties.

The student has also assured us that the confidentiality of any shared data will be maintained, and its use will strictly adhere to academic guidelines laid down by IIT Madras.

We extend our support to Mr.Aman Kumar Rawat in this endeavor and wish him success in his academic pursuits.

FRIENDS ASSOCIATES
AUTH SIGNATORY
BENIRAM KATRA, KAUSHAMBI

Mr. Rajesh Singh
Owner, Naadul Milk

Student Declaration:

I, Aman Kumar Rawat 23f2001035, hereby confirm that all information received from Naadul Milk will be used only for academic purposes as part of the BDM course at IIT Madras. The data will not be shared with any external party.

1. METADATA :

In the workbook, there are two worksheets, each serving a distinct purpose:

- **Sales Data**: Records daily transactions for every product, including quantities sold and revenue generated.

- **Rate and Margin list :** Defines product specifications, cost structure, and pricing details used to validate, analyze, and compare sales performance.

1. Sales Data Worksheet

This sheet captures every sale transaction, providing the foundation for revenue tracking and trend analysis. Dimensions of the dataset : 6 columns and 849 rows.

Column	Description
Date	The exact calendar day on which the sale occurred (formatted YYYY-MM-DD).
Item	The name of the Product which is sold .
Quantity	Number of units sold on that date, expressed in the smallest saleable unit (integer).
Unit	Measurement unit for the quantity (e.g., “pcs”, “kg”, “Crates”), ensuring consistent aggregation.
Price	Selling price per single unit, in Indian rupees (decimal), used to compute transaction revenue.
Amount	Total sale value for the line (Quantity × Price), capturing revenue contribution of that transaction.

Here’s How the Cleaned Sales Dataset Looks like :

	A	B	C	D	E	F
1	**Date**	**Item**	**Quantity**	**Unit**	**Price**	**Amount**
2	2025-04-01	FRESH MILK (CREAM)	1250	Kgs.	278.58	348225
3	2025-04-01	H FCM10% LOOSE	25	Kgs.	500	12500
4	2025-04-01	Lite Dahi Matka 15 Kg	3	Pcs.	1000	3000
5	2025-04-01	NAADUL DAHI POUCH 400 GM	56	Pcs.	26.19	1466.64
6	2025-04-01	NAADUL Full Cream Milk 1000 ML	78	CRATE	774	60372
7	2025-04-01	NAADUL Full Cream Milk 1000 ML	110	Pcs.	64.5	7095
8	2025-04-01	NAADUL Full Cream Milk 500 ML	88	CRATE	782	68816

2. Rate and Margin List Worksheet:

This sheet defines baseline product attributes and maximum retail prices, which underpin cost analysis and price validation.

Column	Description
Variety	Specific product variety name (e.g., FRESH MILK (CREAM), GHEE 4.5 KG), used for identifying product-level sales and cost metrics.
Litre/Kg	Gross volume or weight per standard packaging unit, used to normalize product size for accurate comparison across SKUs.
Qty in pcs/Crate	Number of individual items contained in one crate or bulk unit, useful for inventory planning and unit conversion during sales analysis.
MRP Rate per pcs (₹)	Maximum Retail Price per piece, in Indian Rupees. It serves as the legal upper limit for retail pricing and a benchmark for evaluating billing rates and margins.
Landed Amount (₹)	The total cost incurred by the business to produce, package, and transport the product per transaction — includes direct + indirect operational costs.
Billing Amount (₹)	The total revenue charged to the customer per transaction. This may include applicable taxes and is used to compute overall sales performance.
Profit Margin	Profit derived from each transaction.

3. Justification:

- The Sales Data sheet relies on the Rate List for validating that transaction prices do not exceed the MRP and for converting bulk sales into unit terms when needed.
- Consistent formatting of Date, Quantity, and Price fields ensures seamless time-series analysis and aggregation without unit mismatches.
- By documenting both transactional and reference data in one workbook, analysts can trace every sale back to its defined product attributes, supporting accurate margin calculations and compliance checks.

Here's how the Rate List Worksheet looks like:

Variety	Litre / Kg	Qty in pcs/Crate	MRP	Rate per pcs	Landed Amount	Total Billing Amount	Margin
FCM	1000 ML	12	69	64.50	94828	114912	20084
FCM	500 ML	24	35	33.75	126437	155520	29083
FCM	6 Litre	2	398	372.00	3161	3720	559
Tea Special	1000ML	12	63	56.50	44323	52070	7747
Tea Special	500 ML	24	34	28.75	27702	33120	5418
Tea Special bsb	1000ML	12	66	57.50	45433	55413	9980
Cow Milk	475 ML	24	29	27.00	459	591	132
TM	500 ML	24	27	26.75	3543	4590	1047
TM	170ML	40	10	7.80	25908	31200	5292

Link to Cleaned Dataset: cleaned sales Naadul.xlsx

2. DESCRIPTIVE STATISTICS :

This section presents a detailed statistical summary of the sales and pricing data collected from Naadul Milk between April 1, 2025, and May 30, 2025, covering both transactional records and baseline product profitability metrics. The statistics below summarize central tendencies, variability, and price-related distributions for 33 unique dairy products across 848 transactions.

1. Sales Data Summary (Sheet1)

Metric	Quantity (Units)	Price (₹/Unit)	Revenue (₹/Transaction)
Mean	61.01	₹400.60	₹20,052.53
Median	26.50	₹272.00	₹3,556.59
Mode	1.00	₹33.75	₹15.38
Std. Dev	131.07	₹699.11	₹43,167.87
Min	1.00	₹7.14	₹15.38
Max	1810.00	₹7,901.78	₹5,43,253.40

Justification: These statistics help identify the typical sales pattern and transaction volume. High standard deviation in revenue shows significant variation in sales sizes, justifying the need for ABC analysis. Skewed quantity and revenue distributions support moving averages for trend smoothing.

2. Pricing and Margin Summary (Sheet2: Rate List)

Metric	MRP (₹)	Billing Rate (₹)	Landed Cost (₹)	Billing Amount (₹)	Margin (₹)
Mean	₹605.69	₹485.97	₹5,86,293.00	₹7,25,580.61	₹1,57,054.06
Median	₹67.50	₹56.75	₹2,509.50	₹3,720.00	₹855.00
Std. Dev.	₹1,638	₹1,417.89	₹31,04,373.00	₹39,01,719.00	₹8,44,538.00
Min	₹5.00	₹3.50	₹8.00	₹18.00	₹10.00
Max	₹9,400	₹8,250.00	₹1.75 Cr+	₹2.24 Cr+	₹48.59 Lakh

Justification:

- High variability in cost and margin supports the use of Profit Margin & Pricing Analysis.
- Some products show very high margin dispersion, indicating the need to reprice or optimize based on category profitability.
- These descriptive metrics validate the pricing strategies and reveal opportunities for Product Mix Optimization.

Summary Insights:

- The dataset is highly skewed, with a few products driving the bulk of the revenue.
- The large standard deviation in revenue and margin indicates that not all products contribute equally, reinforcing the use of ABC classification.
- Products with high price but low margin could be reevaluated for strategic pricing decisions.
- Sales behavior is non-uniform, justifying the use of moving average and trend analysis to forecast demand reliably.

DESCRIPTIVE STATISTICS:

Item	Total Sale	Max Sale	Min Sale	Mean Sale	Median Sale	Mode Sale	Total Quantity	Transaction Count
CREAM	1196280.3	543253.4	95237.74	299070.09	278894.6	95237.74	4290	4
FRESH MILK (CREAM)	2066884.6	366589	188693.1	299554.94	300726.72	188693.1	7142	7
FRESH MILK CREAM EXPTED	700	700	700	700	700	700	2	1
Fresh Dahi Cup 90 Gms	825.2	291.6	47.6	206.3	243	291.6	101	4
Fresh Dahi Matka 5 Kgs	9199.94	4857.12	266.66	2299.985	2038.08	266.66	24	4
H FCM10% LOOSE	144978.79	21000	883.92	9061.0494	8049.14	7000	288	16
Lite Dahi Matka 15 Kg	147081.24	9142.8	776.42	4457.0073	4285.72	790.48	165	33
Lite Dahi Matka 5 Kg	154561.33	24285.52	333.34	3680.0317	2609.92	333.34	605	42
NAADUL CLASSIC PANEER 1 KG.	1361.9	542.86	304.76	453.96667	514.28	304.76	5	3
NAADUL CLASSIC PANEER 200 GM	1086.21	217.16	54.28	120.69	108.58	108.58	20	9
NAADUL DAHI POUCH 400 GM	9869.41	1466.64	26.19	358.1263	80.01	53.34	333	27
NAADUL DITE 15 KG BUCKET	1071.42	1071.42	1071.42	1071.42	1071.42	1071.42	1	1
NAADUL DITE 5 KG BUCKET	2571.39	2571.39	2571.39	2571.39	2571.39	2571.39	9	1
NAADUL DTM 170 ML (1X40)	233124	13056	520	4662.48	4624	1820	864	50
NAADUL Full Cream Milk 1000 ML	4384267.5	139650	3225	38458.487	30991.25	7288.5	9995	114
NAADUL Full Cream Milk 500 ML	3808761.4	123120	788	33410.188	29902.5	6288	13223	114
NAADUL GHEE 15 KG TIN	85446.36	39508.9	7633.92	14241.06	7700.89	7633.92	11	6
NAADUL GHEE 4.5 KG	890085.02	110729.11	2043.64	4454.251	4158.72	2043.64	173	200
NAADUL GHEE JAR 1000 ML	1104995	111376.4	441.96	26951.098	10410.84	441.96	2410	41
NAADUL GHEE JAR 200 ML	11786.23	4464.5	446.4	2357.246	1875.09	4464.5	132	5
NAADUL GHEE JAR 500 ML	156954.75	34599.1	223.22	6824.1196	2232.1	223.22	703	23
NAADUL MASALA CHHACH 280 ML (1X24)	17225.21	5070.6	15.38	400.58628	226.7	226.66	1455	43
NAADUL PLAIN CHHACH 300 ML(1X24)	226.66	226.66	226.66	226.66	226.66	226.66	1	1
NAADUL Skimmed Milk 500 ML	62.6	31.3	31.3	31.3	31.3	31.3	4	2
NAADUL TEA SPACIAL 500 ML	1380	1380	1380	1380	1380	1380	2	1
NAADUL TM 170ML(1X40)	6019.72	624	150	463.05538	525	600	683	13
NAADUL TONED MILK 170 ML	94521	3300	75	1410.7612	780	624	1590	67
NAADUL Tea Special Milk 1000 ML	3020936.5	141450	113	35963.53	46425	113	4519	84
NAADUL Toned Milk 500 ML	45589.25	4274.5	53.5	799.8114	669.5	53.5	1755	57
PANEER 5 KG (UNBRANDED)	141550	28350	2500	10110.714	4725	2700	104	14
Sweet Dahi Cup 75 Gms	8824.12	1758.9	35.75	331.69692	214.32	42.9	1177	26
TEA SPL 475 ML	9776	1404	676	888.72727	702	702	44	11
UN BRAND LOOSSES PANEER	17945	10800	285	4486.25	3430	285	35	4

4. Detailed Explanation of Analysis Process/Method:

1. Explanation: Data Cleaning Process

To prepare the Naadul Milk sales data (April 1 – May 30, 2025) for analysis, a structured cleaning process was undertaken using Excel and Python-based tools. Key steps included:

- Data Inspection & Formatting: Ensured consistent column headers (Date, Item, Quantity, Amount, etc.) and validated structure.
- Missing Values Handling: Verified and addressed any blank cells. Critical fields like Date, Item, and Amount were checked to ensure no missing data would affect calculations.
- Duplicate Removal: Redundant or duplicate rows (due to repeated entries or naming mismatches) were identified and removed.
- Outlier Detection: Used domain knowledge to spot anomalies in sales figures (e.g., extremely high or low values) and flagged potential data entry errors.

2. Importance: Why Data Cleaning Matters

Clean data is the foundation of trustworthy analysis. This step ensured:

- Accuracy in calculating statistics like mean, median, and trend lines.
- Consistency across product names and units.
- Reliability of insights used for forecasting and pricing decisions.
- Clarity in visualizations for management reporting.

Without thorough cleaning, results could have been misleading, especially in tasks like trend analysis or product classification that rely heavily on time series and aggregated figures.

1. Moving Average & Trend Analysis

Purpose: To identify recurring sales patterns and seasonal behaviors.

Method:
Using the cleaned transaction dataset, we:

- Grouped daily sales data by Date and Item.
- Applied a 7-day moving average on sales (Amount) for high-performing products

Insight Generated:
This allowed us to detect seasonality and demand cycles which is essential for Order Pattern Forecasting and inventory planning.

2.ABC Analysis for Product Prioritization

Purpose: To categorize products based on revenue contribution.

Method:

- Total sales (Amount) were summed for each unique Item.
- Products were sorted in descending order of revenue.
- Cumulative revenue percentages were computed.
- Classification:
    - A Category: Top 70% of revenue (e.g., Fresh Milk, Ghee)
    - B Category: Next 20%
    - C Category: Bottom 10% (low-frequency or niche products)

Insight Generated:
ABC analysis helps focus on high-value SKUs, optimize delivery resources, and improve profitability aligning directly with the Product Mix Optimization objective.

3. Profit Margin & Pricing Scenario Analysis

Purpose: To determine the most profitable products and evaluate pricing strategies.

Method:

- For each item, the estimated cost was subtracted from selling price (via domain assumptions or provided cost data).
- Products with high volume but low margin were flagged.
- Scenario-based pricing (e.g., 5% price increase) was simulated to assess potential margin gain.

5. RESULT AND FINDINGS:

1. ABC Analysis for Product Prioritization

Our ABC classification reveals a highly concentrated revenue structure:
Category A Products (Top 70% Revenue):

- 3 products generate 65.9% of total revenue (₹1.12 crore)
- NAADUL Full Cream Milk 1000 ML: 25.8% of total revenue
- NAADUL Full Cream Milk 500 ML: 22.4% of total revenue
- NAADUL Tea Special Milk 1000 ML: 17.8% of total revenue

Category B Products (Next 20% Revenue):

- 2 products contribute 19.4% of revenue (₹32.93 lakh)
- Fresh Milk and Cream products

Category C Products (Bottom 10% Revenue):

- 28 products account for only 14.7% of revenue (₹24.97 lakh)

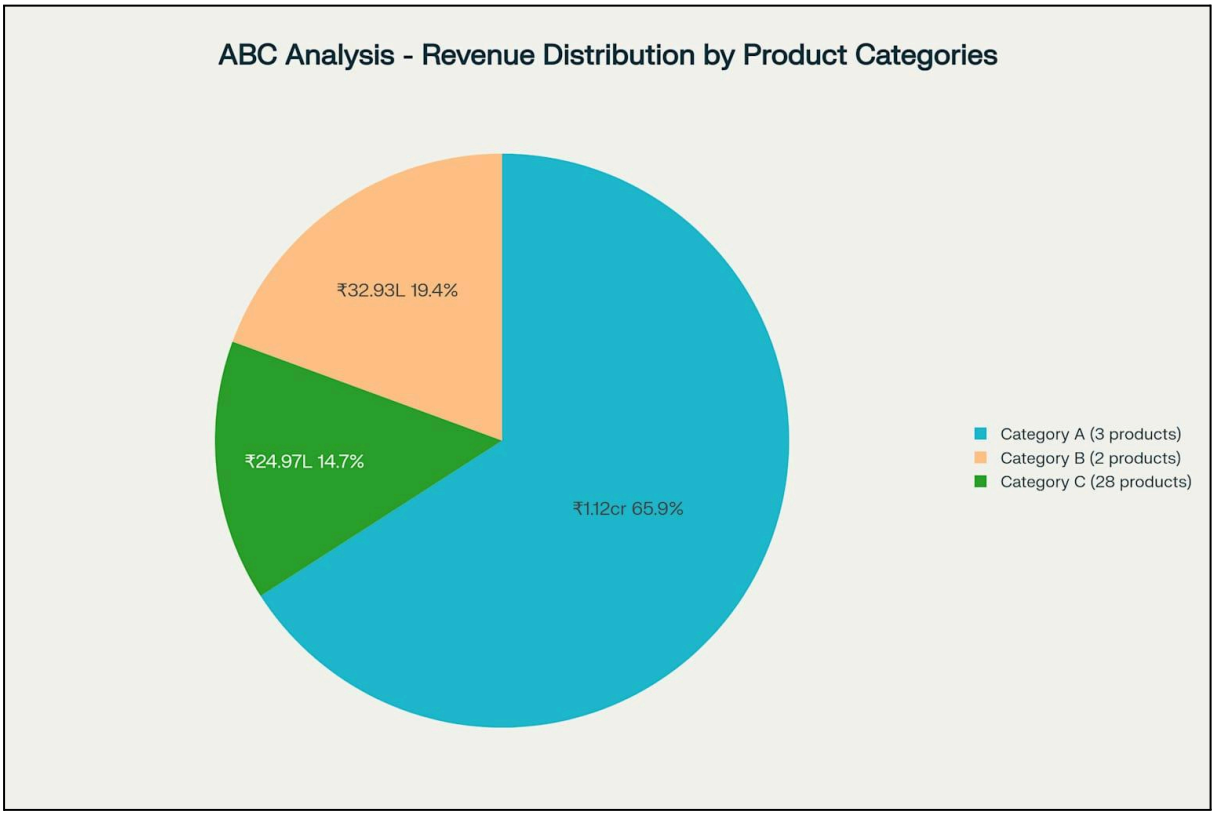


FIGURE : ABC Analysis showing NAADUL's revenue concentration - 3 products generate nearly 66% of total revenue

2.Profit Margin & Pricing Analysis

Profitability Overview:

The profit margin analysis reveals diverse profitability across product categories:

- Overall Performance Metrics:
    - Total Landed Amount: ₹1.88 crore
    - Total Billing Amount: ₹2.39 crore
    - Total Margin: ₹51.55 lakh
    - Overall Margin Percentage: 21.6%

- Top Profit Margin Products:
    - Sweet Dahi Cup: 61.9% margin
    - Fresh Dahi Cup: 55.9% margin
    - Fresh Dahi PP: 33.6% margin

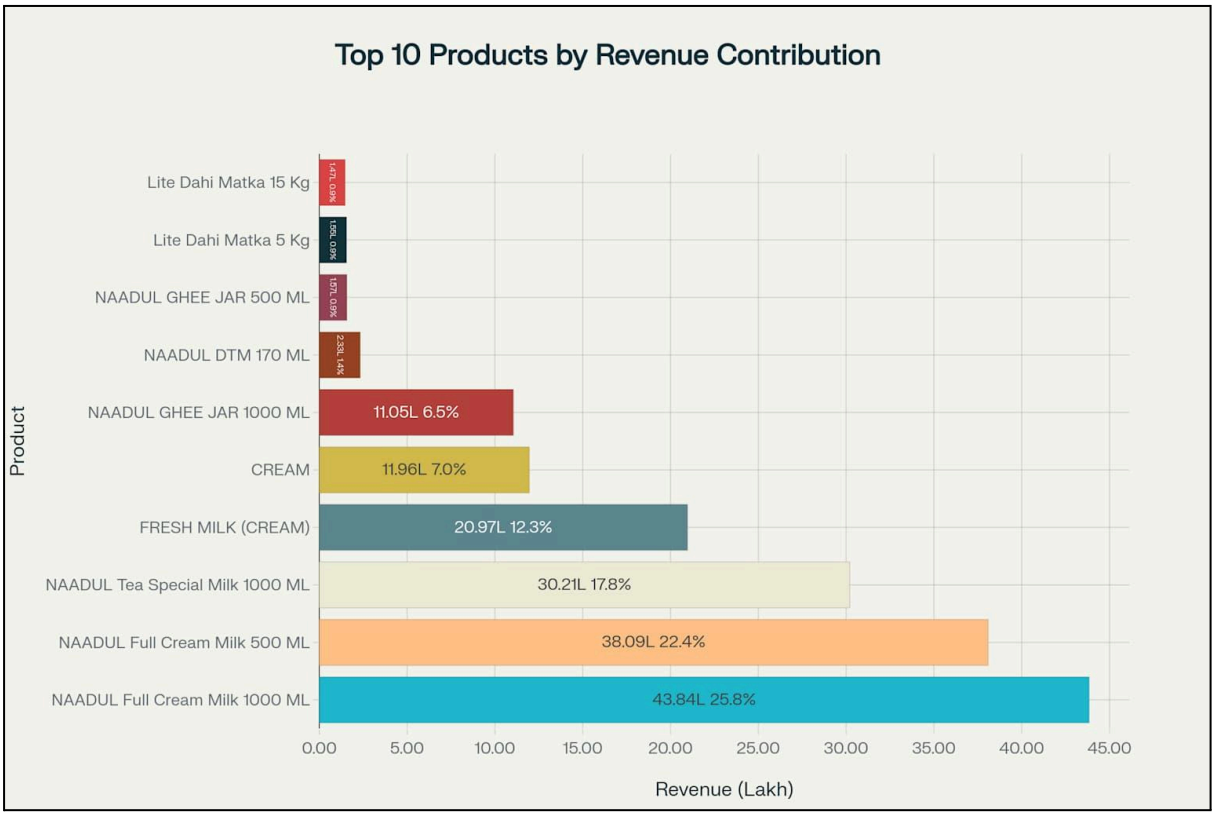


FIGURE : Top 10 revenue-generating products showing the dominance of NAADUL Full Cream Milk products

3.Product Performance Insights

Most Predictable Products (Low Volatility):

- Fresh Milk (Cream): 18.9% volatility - Demonstrates consistent daily demand
- NAADUL Full Cream Milk products: 22.7-26.8% volatility - Premium products with stable customer base
- NAADUL Tea Special Milk: 30.6% volatility - Regular consumption pattern

Highly Variable Products (High Volatility):

- NAADUL MASALA CHHACH: 176.3% volatility - Seasonal beverage with weather-dependent demand
- NAADUL GHEE JAR 500ML: 153.8% volatility - Occasional bulk purchase behavior
- NAADUL GHEE JAR 1000ML: 130.4% volatility - Premium product with irregular purchase cycles

Observed Trends and Patterns:

1.Weekly Demand Cycling

The analysis reveals distinct weekly demand patterns that are crucial for order forecasting. Monday emerges as the strongest sales day with average daily sales of ₹4.45 lakh, followed by Tuesday at ₹3.72 lakh. This creates a clear front-loaded weekly pattern where 48% of weekly sales occur in the first two days.

Reasons Behind This Pattern:

- Weekend stockpiling effect: Customers and retailers replenish inventory after weekend consumption
- Supply chain efficiency: Distributors prioritize Monday-Tuesday deliveries for fresh dairy products
- Consumer behavior: Higher dairy consumption at week start due to meal planning and cooking patterns

2.Sales Volatility Across Dates

Preliminary trend analysis reveals significant daily fluctuations in revenue and quantity, suggesting that demand is not uniform.

This supports the need for Order Pattern Forecasting using Moving Averages and Trend Analysis.

3.Demand Concentration on a Few Products

A small number of SKUs, particularly FRESH MILK (CREAM), NAADUL Full Cream Milk, etc account for a disproportionately high share of revenue.

This validates the Pareto Principle (80/20 Rule) — where roughly 20% of the products contribute to 80% of sales — making it an ideal foundation for ABC Analysis.

Observed Trends and Patterns:

Revenue Optimization Opportunities

1. Category A Focus Strategy: Concentrating resources on the top 3 products can maximize ROI
2. Margin Enhancement: High-margin dairy products (Sweet Dahi, Fresh Dahi) offer expansion potential
3. Inventory Efficiency: Category C products may require portfolio optimization

Operational Insights

1. Weekly Planning: Monday-Tuesday peak demand requires enhanced staffing and inventory
2. Seasonal Adaptation: High volatility products need flexible inventory management
3. Customer Behavior: Consistent products enable predictable revenue for