

# **Navigating Price Volatility: Optimizing Edible Oil Inventory Management for Rahil Enterprise**

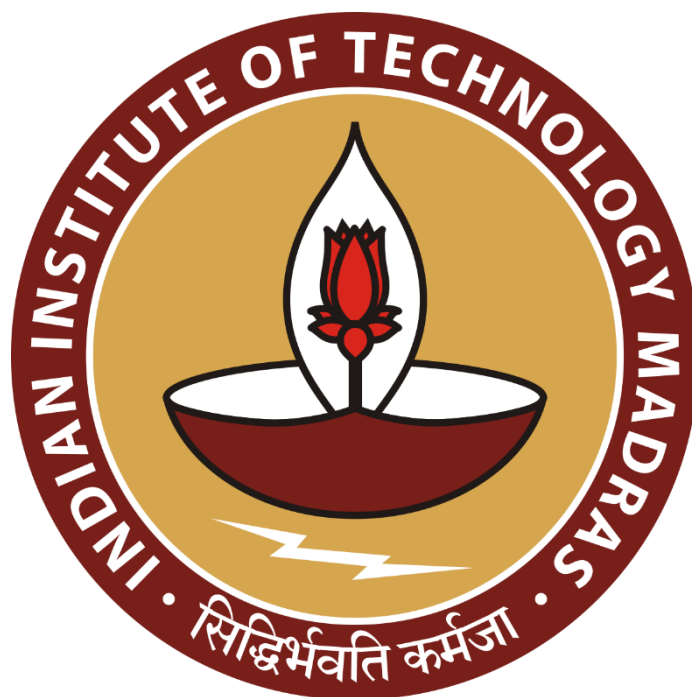
A Mid-term report for the BDM capstone Project

Submitted by

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## Declaration Statement

I am currently working on a project titled "*Navigating Price Volatility: Optimizing Edible Oil Inventory Management for Rahil Enterprise*." I extend my sincere appreciation to Rahil Enterprise for providing the necessary resources that enabled me to conduct this project.

I hereby assert that the data presented and assessed in this project report is genuine and precise to the utmost extent of my knowledge and capabilities. The data has been gathered from primary sources and carefully analyzed to ensure its reliability.

Additionally, I affirm that all procedures employed for the purpose of data collection and analysis have been thoroughly explained in this report. The outcomes and inferences derived from the data accurately depict the findings acquired through comprehensive analytical procedures.

I am committed to adhering to the principles of academic honesty and integrity, and I am open to any additional examination or validation of the data contained in this project report.

I understand that the execution of this project is intended for individual completion and is not to be undertaken collectively. Therefore, I affirm that I have not engaged in any form of collaboration with other individuals, and all work undertaken has been solely conducted by me. In the event that plagiarism is detected in the report at any stage of the project's completion, I am fully aware and prepared to accept disciplinary measures imposed by the relevant authority.

I understand that all recommendations made in this project report are within the context of the academic project undertaken for course fulfillment in the BS Degree Program offered by IIT Madras. The institution does not endorse any of the claims or comments.



Signature of Candidate

Name: Azarudin Bihari

Date: 22/04/2024

## **1. Executive Summary**

This mid-term report focuses on studying the financial data from Rahil Enterprise related to one specific edible oil product, Fortune Refined Soyabean Oil 15KG Tin, over a two-year period. The financial data for this product was collected and analyzed to uncover insights directly from this internal data. The aim is to understand trends and insights from this internal data as a foundation for a more detailed final report.

The final report will delve into other internal factors (like sales patterns and inventory levels) and external factors (such as global market conditions and government policies) concerning additional products in Rahil Enterprise's portfolio.

From our internal data analysis of Fortune Refined Soyabean Oil 15KG Tin, we have uncovered key insights:

- This product experienced notable price changes during the observed period.
- Sales quantities and revenues varied over the two-year period.
- Changes in stock levels provide insights into how Rahil Enterprise manages inventory for this specific oil product.

These initial findings highlight the importance of using internal data to improve inventory management and pricing strategies for Fortune Refined Soyabean Oil 15KG Tin at Rahil Enterprise. This report lays the groundwork for our final analysis, which will include discussions of other products and comprehensive recommendations for Rahil Enterprise's business operations.

## **2. Proof of originality of the Data**

To ensure the data's authenticity, we gathered evidence from Rahil Enterprise, including photos of their office (Figure 1) and godown (Figure 2), showing their operational setup. A video chat with Mr. Samir Bihari confirmed inventory challenges. An invoice for an edible oil transaction provided further validation. For all collected evidence, visit this folder link: [Evidence Folder](#).



Figure 1: Office premises of Rahil Enterprise



Figure 2: Godown where Rahil Enterprise stores their products

These pieces of evidence collectively support the originality and validity of the data used for this project analysis.

### 3. Metadata and Descriptive Statistics

#### 3.1 Metadata

The metadata provides insights into the financial data collected from Rahil Enterprise for six top-selling edible oils of interest to Mr. Samir. These oils include: Fortune Refined Soyabean Oil, Fortune Refined Cottonseed Oil, Fortune Refined Sunflower Oil, Puffpride Vanaspati Ghee, RAAG Gold Refined Palmolein Oil, Vitalife Refined Soyabean Oil

Each of these oils has its own dedicated Excel file, containing transaction records covering one fiscal year. The data was extracted from Tally Prime software and is organized into specific columns, including:

- Date: Transaction date in DD-MM-YY format
- Particulars: Name of the customer or supplier involved in the transaction
- Voucher Type: Type of transaction (e.g., Sales - GST, Purchase - GST)
- Voucher Number: Unique identifier for each transaction
- Inwards Quantity: Quantity of oil received in the transaction
- Inwards Value: Monetary value of oil received
- Outwards Quantity: Quantity of oil dispatched in the transaction
- Outwards Value: Monetary value of oil dispatched
- Closing Quantity: Quantity of oil remaining at the end of the day
- Closing Value: Monetary value of oil remaining at the end of the day

A preview image of the Excel file format used for storing this data is provided below.

Shop No. 55, Ground Floor									
Near Hotel Ambika, Milkat No. 2798, SH 41									
Teniwada, Ta-Vadgam, Banaskantha, Gujarat 385210									
FSSAI -10721005000505									
<b>FORTUNE REFINED SOYABEAN OIL 15KG TIN</b>									
Stock Item Register									
1-Apr-22 to 31-Mar-23									
D	Particulars	Vch Type	Vch I	Inwards		Outwards		Closing	
				Quantity	Value	Quantity	Value	Quantity	Value
01-Apr-22	Opening Balance			395 TIN	840381.53			395 TIN	840381.53
02-Apr-22	MAHAVEER AND CO.- ABU ROAD	SALES - GST	RE/22-23/001			200 TIN	489714.00		
02-Apr-22	JAY GOGA TRADING COMPANY	SALES - GST	RE/22-23/002			75 TIN	188928.75		
02-Apr-22	SHRI UMIYA OIL DEPO - Sidhapur	SALES - GST	RE/22-23/003			25 TIN	62976.25		
02-Apr-22	SHAH POPATLAL MANILAL	SALES - GST	RE/22-23/004			60 TIN	151143.00		
02-Apr-22	MEENA BAZAR - CHHAPI	SALES - GST	RE/22-23/005			6 TIN	14857.14		
02-Apr-22	SHREE TRADING CO	PURCHASE GST	1	25 TIN	62857.00				
02-Apr-22	SHREE TRADING CO	PURCHASE GST	2	100 TIN	251428.00			154 TIN	341958.93
04-Apr-22	Manish Trading Company	SALES - GST	RE/22-23/008			50 TIN	125952.50		
04-Apr-22	Samir Bhai Suliya	SALES - GST	RE/22-23/009			15 TIN	37857.15		
04-Apr-22	Samir Bhai Suliya	SALES - GST	RE/22-23/011			10 TIN	24666.70		
04-Apr-22	MAHESHWARI TRADING CO	SALES - GST	RE/22-23/014			10 TIN	24571.40		
04-Apr-22	NITIN TRADING CO	SALES - GST	RE/22-23/015			64 TIN	160000.00	5 TIN	11102.56
05-Apr-22	NITIN TRADING CO	SALES - GST	RE/22-23/018			25 TIN	62500.00		

Figure 3: Common preview image of the Excel file format

## 3.2 Descriptive Statistics

The following tables provide a comprehensive analysis of buy and sell quantities, values (in INR), and average values per unit (in INR) for various edible oil items over the specified financial years and periods.

FORTUNE REFINED SOYABEAN OIL 15KG TIN					Financial Year: 2022-23	
Month	Total Buy Quantity	Total Buy Value (INR)	Average Buy Value per Unit (INR)	Total Sell Quantity	Total Sell Value (INR)	Average Sell Value per Unit (INR)
January	2000	4179045	2089.52	1606	3362804.51	2093.90
February	2550	5056776	1983.05	2452	4902960.24	1999.58
March	2730	5042046.9	1846.90	2742	5153766.26	1879.56
April	2675	6434482.53	2405.41	2528	6277106.47	2483.03
May	1120	2830100	2526.88	878	2298337.11	2617.70
June	525	1279673	2437.47	799	1953937.81	2445.48
July	880	1880142.7	2136.53	988	2133262.56	2159.17
August	1175	2455711.25	2089.97	985	2068553.21	2100.05
September	2700	5369231.3	1988.60	2646	5270979.3	1992.06
October	4200	8488659	2021.11	4083	8300525.2	2032.95
November	4390	9795066.1	2231.22	3653	8187875.66	2241.41
December	3460	7214662.38	2085.16	4562	9566839.84	2097.07
<b>Grand Total</b>	<b>28405</b>	<b>60025596.16</b>	<b>2113.21</b>	<b>27922</b>	<b>59476948.17</b>	<b>2130.11</b>

Table 1: Monthly buy and sell analysis of FORTUNE REFINED SOYABEAN OIL 15KG TIN during the financial year 2022-23

FORTUNE REFINED SOYABEAN OIL 15KG TIN					Financial Year: 2023-24	
Month	Total Buy Quantity	Total Buy Value (INR)	Average Buy Value per Unit (INR)	Total Sell Quantity	Total Sell Value (INR)	Average Sell Value per Unit (INR)
January	2990	4747503.8	1587.79	2988	4738812.06	1585.95
February	2750	4339840	1578.12	2827	4502059.06	1592.52
March	2310	3754197.4	1625.19	2051	3368795.6	1642.51
April	2683	5037502.65	1877.56	2412	4384880.99	1817.94
May	1600	2674366	1671.48	1858	3113894.04	1675.94
June	3265	5154346.85	1578.67	3274	5229735.11	1597.35
July	3050	5084264.5	1666.97	2382	3997686.84	1678.29
August	1950	3237542	1660.28	2335	3869939.42	1657.36
September	2600	4088294	1572.42	2794	4405201.27	1576.66
October	2990	4696899.2	1570.87	2394	3750962.13	1566.82
November	2500	4119777	1647.91	2492	4108072.4	1648.50
December	1390	2245092.8	1615.17	1982	3236750.06	1633.07
<b>Grand Total</b>	<b>30078</b>	<b>49179626.2</b>	<b>1635.07</b>	<b>29789</b>	<b>48706788.98</b>	<b>1635.06</b>

Table 2: Monthly buy and sell analysis of FORTUNE REFINED SOYABEAN OIL 15KG TIN during the financial year 2023-24

Financial Year: 2022-23						
Item Name	Total Buy Quantity	Total Buy Value (INR)	Average Buy Value per Unit (INR)	Total Sell Quantity	Total Sell Value (INR)	Average Sell Value per Unit (INR)
FORTUNE REFINED SOYABEAN OIL 15KG TIN	28405 TIN	60025596.16	2113.21	27922 TIN	59476948.17	2130.11
FORTUNE REFINED COTTONSEED OIL 15KG TIN	1500 TIN	3067888.80	2045.26	1450 TIN	3010580.24	2076.26
FORTUNE REFINED SUNFLOWER OIL 15LTR TIN	2891 TIN	5998395.35	2074.85	2853 TIN	6041131.34	2117.47
PUFFPRIDE VANASPATI GHEE 15KG BOX	8750 BOX	13998917.75	1599.88	8428 BOX	13809895.44	1638.57
RAAG GOLD REFINED PALMOLEIN OIL 15KG TIN	2000 TIN	3320549.00	1660.27	1896 TIN	3195114.88	1685.19
VITALIFE REFINED SOYABEAN OIL 15KG TIN	3338 TIN	6679701.51	2001.11	3136 TIN	6467391.97	2062.31

Table 3: Analysis of buy and sell quantities, values (in INR), and average values per unit (in INR) for various edible oil items during the financial year 2022-23

Financial Year: 2023-24						
Item Name	Total Buy Quantity	Total Buy Value (INR)	Average Buy Value per Unit (INR)	Total Sell Quantity	Total Sell Value (INR)	Average Sell Value per Unit (INR)
FORTUNE REFINED SOYABEAN OIL 15KG TIN	30078 TIN	49179626.20	1635.07	29789 TIN	48706788.98	1635.06
FORTUNE REFINED COTTONSEED OIL 15KG TIN	2725 TIN	4308072.76	1580.94	2721 TIN	4357246.31	1601.34
FORTUNE REFINED SUNFLOWER OIL 15LTR TIN	5488 TIN	8314855.25	1515.10	5338 TIN	8149465.90	1526.69
PUFFPRIDE VANASPATI GHEE 15KG BOX	9908 BOX	13828222.32	1395.66	9907 BOX	14128718.58	1426.13
RAAG GOLD REFINED PALMOLEIN OIL 15KG TIN	5031 TIN	7307750.95	1452.54	4953 TIN	7319756.77	1477.84
VITALIFE REFINED SOYABEAN OIL 15KG TIN	2642 TIN	4050278.75	1533.04	2641 TIN	4081994.09	1545.62

Table 4: Analysis of buy and sell quantities, values (in INR), and average values per unit (in INR) for various edible oil items during the financial year 2023-24

Below table provides crucial inventory analysis metrics for Rahil Enterprise's products, emphasizing a 95% desired service level and an average lead time of 5 days. These metrics offer insights into inventory control dynamics, including average daily sales, demand variability, safety stock levels, and reorder points

Inventory Analysis Metrics by Product			Desired Service Level (%)		95	Average Lead Time (Days)		5
Item Name	Average Daily Sales (FY 2022-23)	Average Daily Sales (FY 2023-24)	Average Daily Sales (Overall)	Demand Standard Deviation (FY 2022-23)	Demand Standard Deviation (FY 2023-24)	Demand Standard Deviation (Overall)	Safety Stock	Reorder Point
VITALIFE REFINED SOYABEAN OIL 15KG TIN	18 TIN	17 TIN	17 TIN	23.71491276	23.16257052	23.43874164	86 TIN	172.6
RAAG GOLD REFINED PALMOLEIN OIL 15KG TIN	34 TIN	31 TIN	33 TIN	42.70338653	26.046256	34.37482126	127 TIN	289.347
PUFFPRIDE VANASPATHI GHEE 15KG BOX	62 TIN	93 TIN	77 TIN	71.37184227	154.538812	112.9553271	417 TIN	803.148
FORTUNE REFINED SOYABEAN OIL 15KG TIN	109 TIN	108 TIN	109 TIN	120.8426417	107.8023366	114.3224892	422 TIN	965.279
FORTUNE REFINED COTTONSEED OIL 15KG TIN	20 TIN	25 TIN	23 TIN	21.75102753	25.66074461	23.70588607	87 TIN	201.385
FORTUNE REFINED SUNFLOWER OIL 15LTR TIN	22 TIN	24 TIN	23 TIN	23.61946903	23.62853965	23.62400434	87 TIN	201.932

Table 5: Inventory Analysis Metrics by Product with Desired Service Level of 95% and Average Lead Time of 5 Days

## 4. Detailed Explanation of Analysis Process/Method

The analysis approach involves a comprehensive examination of Rahil Enterprise's financial data related to their top six edible oil products over the financial years 2022-23 and 2023-24. The key steps in the analysis process are:

### Descriptive Analysis

The first step is to perform descriptive analysis, which provides a clear understanding of how Rahil Enterprise's edible oil products are performing. This involves:

- Aggregating the total quantities bought and sold for each product across different months and years to identify popular products and demand trends.
- Calculating the total transaction values to understand the financial impact.
- Determining the average unit prices when bought and sold to reveal pricing trends.

These basic metrics offer a solid foundation for further analysis and decision-making.

### Trend Analysis

Trend analysis is conducted to examine monthly transactional patterns and detect seasonal variations in buying and selling quantities and values. This helps understand how demand fluctuates throughout the year. Additionally, comparing the performance of each product over the past two financial years reveals growth or decline in sales and values, guiding inventory management and business strategies.

### Inventory Analysis Metrics

Inventory analysis metrics are crucial for managing inventory efficiently and meeting customer demand effectively. During a subsequent meeting, Mr. Samir Bihari provided additional insights on the company's operations:

Mr. Bihari mentioned that the typical lead time for Rahil Enterprise's edible oils ranges from 3 to 7 days. To accommodate this variability, an average lead time of 5 days was calculated.

Mr. Bihari recommended a desired service level of 95% for the company's inventory operations. This service level ensures that inventory levels are optimized to meet customer demand reliably while minimizing the risk of running out of stock.



Incorporating these insights from Mr. Bihari allows Rahil Enterprise to strategically manage their inventory. By basing the analysis on a 95% desired service level and an average 5-day lead time, the company can improve both customer satisfaction and operational efficiency.

The key inventory analysis metrics calculated include:

#### Average Daily Sales (ADS)

Indicates the average daily units sold, calculated as Total Sell Quantity divided by the Number of Days in the Period.

$$ADS = \frac{\text{Total Sell Quantity}}{\text{Number of Days in the Period}}$$

#### Demand Variability

Demand variability is a crucial metric that measures the fluctuations in product demand over time. The formula for calculating the standard deviation of demand is:

$$\text{Standard Deviation of Demand} = \sqrt{\frac{\sum_{i=1}^n (D_i - \text{Mean Demand})^2}{n - 1}}$$

Where:

- $D_i$ : The demand in a specific period (like daily, weekly, or monthly demand).
- Mean Demand: The average demand over the specified period.
- $n$ : The total number of periods.

#### Safety Stock

Safety stock is a critical inventory metric that acts as a buffer against demand fluctuations and uncertainties in the supply chain. It ensures that a company can meet customer demand reliably while minimizing the risk of stockouts. The formula for calculating safety stock, assuming a normal distribution and a desired service level, is:

$$\text{Safety Stock} = Z \times \text{Standard Deviation of Demand} \times \sqrt{\text{Lead Time in Days}}$$

Where:

- $Z$ : A Z-score based on the desired service level (e.g.,  $Z \approx 1.645$  for a 95% service level).
- Standard Deviation of Demand: The calculated variability in demand.
- Lead Time in Days: The average time it takes to replenish inventory.

#### Reorder Point

The reorder point is a crucial inventory management metric that indicates when to place a new order to replenish stock and avoid stockouts during the lead time. The formula for calculating the reorder point is:

$$\text{Reorder Point} = \text{Average Daily Sales} \times \text{Lead Time in Days} + \text{Safety Stock}$$

Where:

- Average Daily Sales: Calculated using the formula for ADS.
- Lead Time in Days: The average time it takes to receive new inventory.
- Safety Stock: Additional stock to cover unexpected demand or delays.

By leveraging these inventory analysis metrics, Rahil Enterprise can make informed decisions to optimize inventory levels, enhance customer service, and improve overall operational performance.

## 5. Results and Findings

This section presents the analysis of Rahil Enterprise's financial data related to its different edible oil products during the financial years 2022-23 and 2023-24. While the focus here is on specific products, it's important to note that a complete overview of all products and their analysis, including any domestic and global factors affecting their performance, will be included in the final project report.

In this report, the specific examination is on the performance of FORTUNE REFINED SOYABEAN OIL 15KG TIN across the financial years 2022-23 and 2023-24. Through this analysis, several key findings have emerged that offer insights into the trends and performance of this particular product.

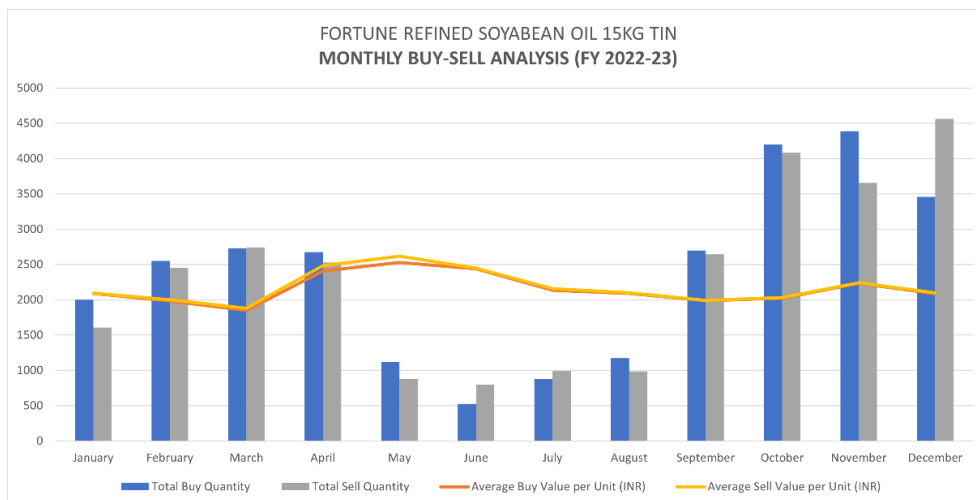


Figure 4: Comparison of total buy and sell quantities and average buy and sell values per unit of FORTUNE REFINED SOYABEAN OIL 15KG TIN across months in FY 2022-23

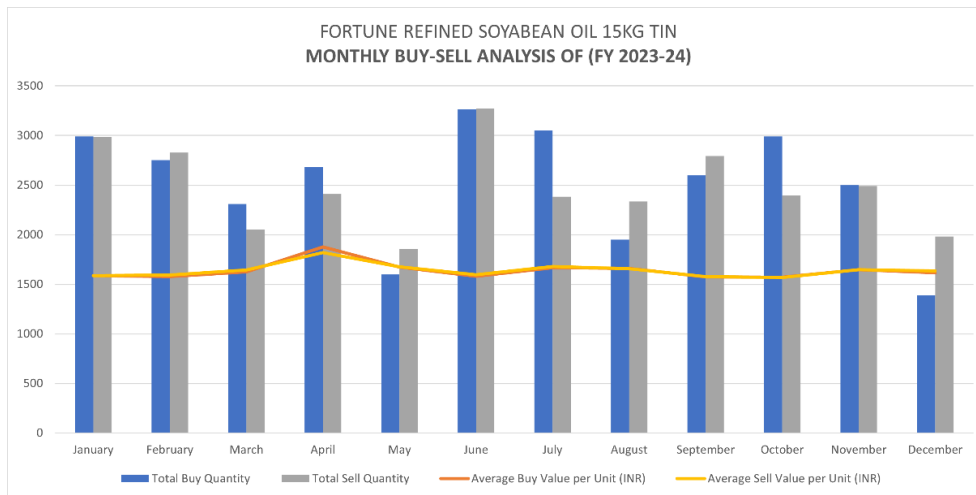


Figure 5:: Comparison of total buy and sell quantities and average buy and sell values per unit of FORTUNE REFINED SOYABEAN OIL 15KG TIN across months in FY 2023-24

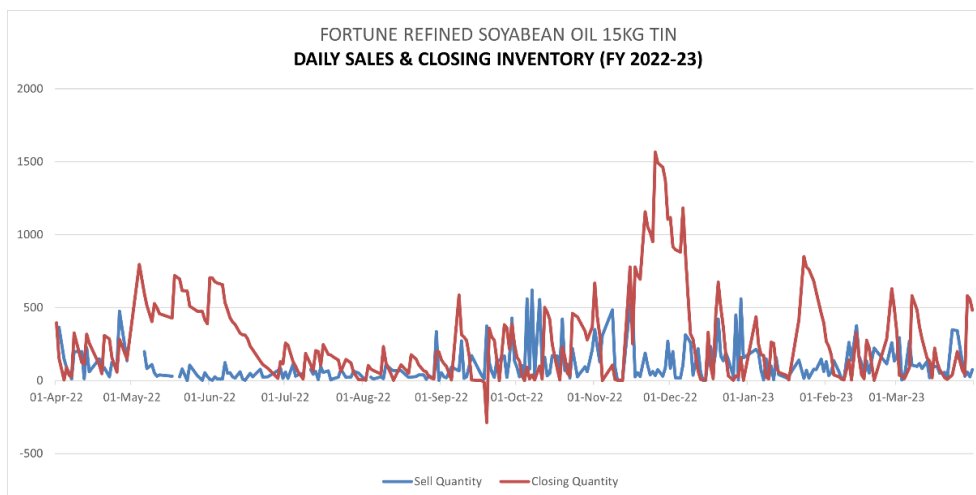


Figure 6: Daily Sales and Closing Inventory of FORTUNE REFINED SOYABEAN OIL 15KG TIN over the FY 2022-23

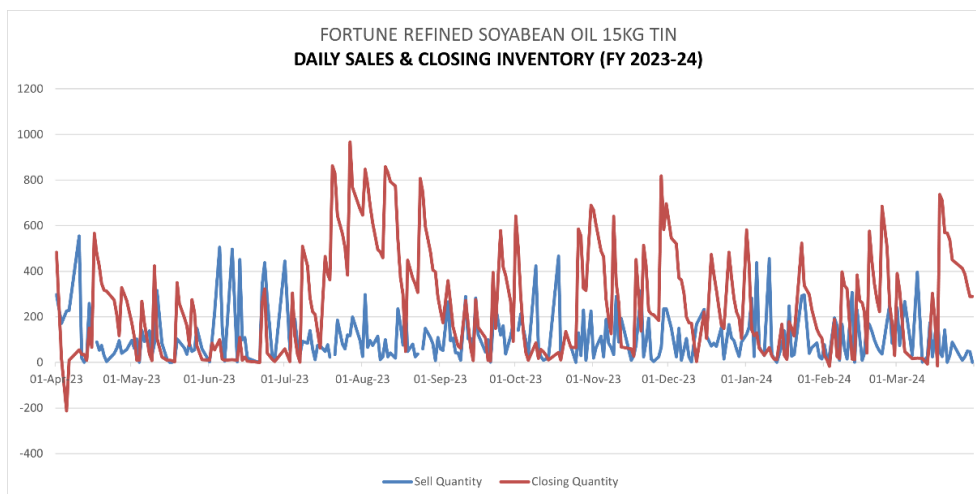


Figure 7: Daily Sales and Closing Inventory of FORTUNE REFINED SOYABEAN OIL 15KG TIN over the FY 2023-24

**Volatility Trends:**

The fiscal year 2022-23 witnessed notable volatility compared to 2023-24, particularly evident in fluctuations of buy and sell quantities across months (refer to Figures 4 and 5).

**Price Patterns:**

Both fiscal years saw price increases in April, resulting in higher average buy and sell values per unit during this period.

**Demand Patterns:**

Demand for FORTUNE REFINED SOYBEAN OIL 15KG TIN peaked consistently from October to December in both fiscal years, indicating a seasonal surge in market demand during this quarter.

**Inventory Control Issues:**

Based on the analysis, it is recommended to maintain a safety stock of 422 units and place reorders when inventory levels drop below 965 units to prevent stockouts and ensure timely replenishment.

The data revealed instances of stockouts when inventory levels hit zero, highlighting the need for improved inventory management practices. Overstocking was also observed when inventory exceeded 1,500 units, indicating a need to align inventory levels more closely with demand fluctuations.

**Improving Reorder Practices:**

There were inconsistencies in placing reorder requests when inventory levels fell below the established reorder point. This indicates a need for better alignment with reorder thresholds and more proactive ordering practices.

In summary, while the analysis provides valuable insights into the performance of FORTUNE REFINED SOYBEAN OIL 15KG TIN, it underscores the importance of optimizing inventory management practices to enhance supply chain efficiency and meet customer demand effectively.