

A Comparative Study of Consumer Preference: Local Dairy Milk at Shyam Dairy

A End-term report for the BDM capstone Project

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1. Executive Summary

Shyam dairy, a small scale B2C business running in Shahdara, East Delhi, has been providing fresh milk to customers for over 40 years. Mr. Mahesh Chand Sharma, the owner is the second generation in this business. They mainly offer high-quality fresh milk which is a direct competition to the cheap and easily available packaged milk in the market. Additionally, it is also a general store, where they sell packaged milk and other day to day items as a source of extra money. The key issues that the business faces are high price sensitivity, limited availability of fresh milk, and lack of advertising, which leads to customer churn and difficulties faced in acquiring new customers.

This study is aimed to analyse customer preferences and sales trends to identify strategies to improve sales and customer retention. By using a quantitative approach which involves data analysis using MS Excel and Python, there were useful insights derived from two months of data (May and October). The analysis showed the major key patterns like the effect of price and availability on consumers, and it gives a better understanding of fresh milk vs packaged milk sales. These results were used to recommend strategies, including adjustments in prices and improved marketing, to work on the identified challenges effectively.

Key Finding:

- Packaged milk outperforms the fresh milk due to major price difference (₹68/litre vs ₹77/litre) and availability, and also fresh milk is available only in the morning and evening.
- Retention rates stayed strong, but a noticeable churn rate indicates price sensitivity to price hikes and availability.
- October sales trends show a reduction in sales of fresh milk and a high variability, which can be caused by price sensitivity and seasonal factors.

Recommendations:

- Introduce discounts and loyalty programs to retain existing customers.
- Figure out delivery options or increase the availability hours to provide ease.
- Launch awareness campaigns mainly focussing on the health benefits of fresh milk.

By implementing these strategies, Shyam Dairy can address its challenges, improve customer retention, and stabilise fresh milk sales, ensuring long-term growth in a competitive market.

2. Detailed Explanation of Analysis Process/Methods

2.1 Data Collection

For analysis, the data was collected from Shyam dairy's daily records. They record customer-wise milk purchases along with the quantity of the milk they bought.

I gathered data for 2 months, namely May and October to do my analysis. They store data in the registers so I first converted that into excel files.

The data was organised into multiple sheets in an Excel file, such as May data, October data, and Fresh Milk bought. Python's pandas library was used to load and structure this data for further analysis. These sheets provided essential details about daily milk sales and customer-wise purchases.

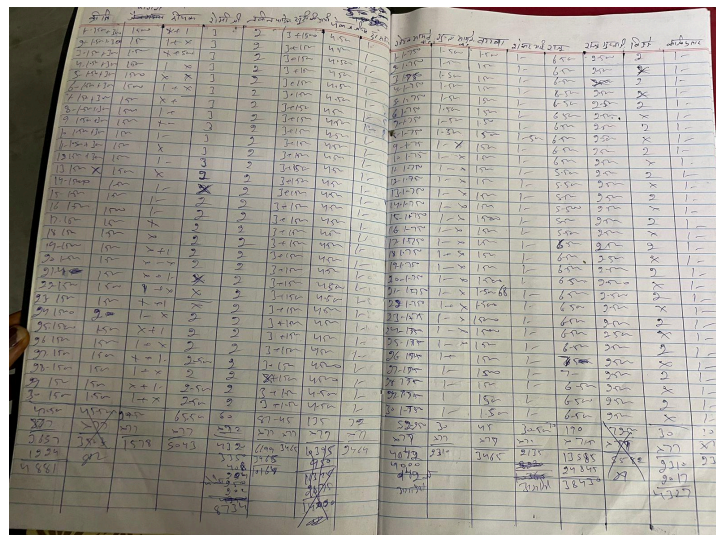


Fig 1. Shyam Dairy's Record Register

Date	Kaagaz wali/Aggarwal	Allah miya/shehnawaz	Anil Sharma	Arun ji	Rakesh	Yogesh	Bramjeet	Gaurav Gupta
01-10-2024	2	0	5	4	2	0	1.5	1.5
02-10-2024	2	0	7	4	2	0	1.5	1.5
03-10-2024	2	1	7	4	2	1.5	1.5	1.5
04-10-2024	2	1.5	7.5	4	2	0	1.5	1.5
05-10-2024	2	1.5	7.5	4	2	1.5	1.5	1.5
06-10-2024	2	1.5	7	4	2	1.5	1.5	1.5

Fig 2. Excel Sheet of Shyam Dairy's Record

For fresh milk they have data of how much they bought in morning and evening both on a daily basis. However, for packaged milk, the amount they buy varies daily.

For packaged milk it is difficult to store data of each and every customer so they just store how much milk they sold on a daily basis. DATA LINK: [BDM Project Data](#)

Data of May and October was chosen because after May the price of both local and packaged milk increased so this will help a lot in my analysis as to how customer behaviour and trend changes over different periods and variable rates.

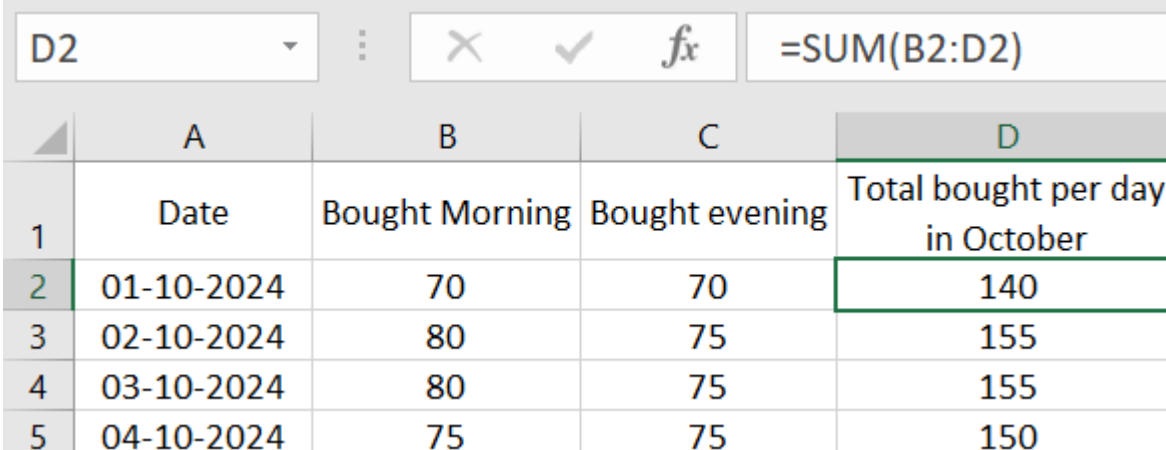
They have around 65 regular customers for fresh milk, which made it a bit challenging to keep track of the data in Excel files. Recording details like how much milk was bought in the morning and evening every day needed a lot of time and attention.

2.2 Data Cleaning

Data cleaning is a very important step in the process of data analysis because if the data is not cleaned correctly it will lead to anomalies. So to prevent this, data preprocessing was done.

For example, there were some unnamed columns due to some file formatting issues, so they were removed, and in some places to fill empty cells/null values “0” was imputed. There were some duplicate columns which were removed. The pandas library was used for these operations.

In the “fresh milk bought” sheet it stores milk bought in the morning and milk bought in the evening so to combine this in a single column I used the excel formula to sum the milk bought in the morning and the evening to combine it to total milk bought in a day.



	A	B	C	D
1	Date	Bought Morning	Bought evening	Total bought per day in October
2	01-10-2024	70	70	140
3	02-10-2024	80	75	155
4	03-10-2024	80	75	155
5	04-10-2024	75	75	150

Fig 3. Excel sheet with formulas

```
# Drop columns with "Unnamed" in their names
packaged_milk_sales.dropna(axis=1, how='all', inplace=True)
fresh_milk_sold.dropna(axis=1, how='all', inplace=True)
fresh_milk_bought.dropna(axis=1, how='all', inplace=True)
october_data.dropna(axis=1, how='all', inplace=True)
may_data.dropna(axis=1, how='all', inplace=True)
local_vs_packaged.dropna(axis=1, how='all', inplace=True)
comparing_customers.dropna(axis=1, how='all', inplace=True)
```

```
may_data['Total Milk Sold'] = may_data.iloc[:, 1:].sum(axis=1)
```

Fig 4. Data Pre-processing in Python Notebook

Since I used both excel and python, you can see the snippets of both for data cleaning.

2.3 Descriptive Analysis

Descriptive analysis was performed because it provides summary statistics of the dataset which is helpful in providing the overview of the dataset, highlighting trends and variability and also provides the insights into customer preferences for fresh and packaged milk. To understand the trends in fresh milk sales, bar plots and line graphs were created using Python's matplotlib and seaborn libraries. These visualisations provided a clear comparison of sales patterns across May and October and highlighted the demand variation.

Key metrics calculated:

- Mean: It represents the average daily milk sales.

$$\text{Mean} = \frac{\text{Sum of All Daily Sales}}{\text{Number of Days}}$$

$$\text{=AVERAGE(B2:B32)}$$

- Median: It identifies the central tendency of daily sales.

If the number of days is odd:

Median = Middle Value in Sorted Data

=MEDIAN(B2:B32)

If even:

$$\text{Median} = \frac{\text{Middle Two Values}}{2}$$

- Standard Deviation: It measures how much daily sales deviate from the mean.

$$\text{Standard Deviation} = \sqrt{\frac{\sum (x_i - \bar{x})^2}{N}}$$

$$\text{=STDEV.S(B2:B32)}$$

Key metric analysis:

2.3.1 The table below summarises the daily sales metrics for local fresh milk in May and October:

Total Milk Sold per Month (May and October)		
Column1 ▼	May ▼	October ▼
Mean	143.8790323	140.016129
Median	145	145.5
Standard Deviation	3.13639321	13.54220801
Minimum	135.5	108.5
Maximum	148.5	159

Fig 5.Total milk sold per month

Key Observations:

1.Average Daily Sales:

- May had higher average daily sales (143.88 litres) than October (140.01 litres), which indicates decline in demand in October.
- This suggests that external factors, such as seasonal preferences or price sensitivity, may have changed customer behaviour in October.

2.Median Daily Sales:

- The median daily sales were stable across both months (145 litres for May and 145.5 litres for October). This shows that general sales did not vary much, but the mean was different for both.

3.Standard Deviation (Variability):

- October showed higher variability (13.54 litres) compared to May (3.13 litres). This indicates more varying demand in October, maybe due to factors like pricing changes or inconsistent customer preferences.

4.Minimum and Maximum Sales:

- The minimum daily sales in October (108.5 litres) were quite lower than in May (135.5 litres), which tells that certain days in October had very low demand probably because of the high milk prices.
- The maximum daily sales were higher in October (159 litres) than in May (148.5 litres), which shows a wide range of daily sales values in October.

Interpretation:

1. Seasonal Decline in October: The low average and high variability in October sales show seasonal influences other factors like packaged milk. Shyam Dairy may need to stabilise prices or promote fresh milk more and more during this period.
2. Higher Variability in October: The increased variability in October sales show that customer preferences were less predictable. This can be because of competition from packaged milk, price sensitivity, or changes in availability.
3. Business Implications:
 - The minimum sales in October being lower than May show that it's important to focus on days with low demand. This can be done by using targeted marketing campaigns to attract more customers.
 - The maximum sales in October being higher than May show there's potential for max demand to grow even more. This can be tapped by giving special promotions or discounts to people to increase sales.

2.3.2 To understand customer preferences, we compared daily sales metrics for local and packaged milk across May and October. The results are summarised in the table below:

Metric	Local Milk - May	Packaged Milk - May	Local Milk - October	Packaged Milk-October
Average Daily Sales	143.8790323	149.5483871	140.016129	148.8709677
Median Daily Sales	145	149	145.5	150
Standard Deviation	3.13639321	6.1323661	13.54220801	8.032193289
Total Monthly Sales	4460.25	4636	4340.5	4615
Max Daily Sales	148.5	160	159	161
Min Daily Sales	135.5	139.5	108.5	135

Fig 6. Metrics for Local milk vs Packaged Milk

Key observations from the above table are:

1. Average Daily Sales:

- Packaged milk consistently outperformed local fresh milk in both May (149.55 litres vs. 143.88 litres) and October (148.87 litres vs. 140.01 litres).
- Local fresh milk sales declined a little from May to October (143.88 litres to 140.01 litres), while packaged milk remained stable.

2. Median Daily Sales:

- The median values for both months and milk types are close to their averages. This tells us that sales are evenly distributed, with no such outliers affecting the data.

3. Standard Deviation (Variability):

- Local fresh milk in October had the highest variability (SD: 13.54 litres), which tells us that the fluctuating demand is possibly due to price sensitivity or customer preferences.
- Packaged milk showed low variability across both months (May: 6.12 litres; October: 8.03 litres), indicating more stable demand.

4. Total Monthly Sales:

- Packaged milk sales exceeded local milk sales in both months, with October showing a smaller gap (4615 litres for packaged vs. 4340.5 litres for local milk).

5. Maximum and Minimum Daily Sales:

- Maximum daily sales were consistently higher for packaged milk in both months, reaching up to 161 litres in October compared to 159 litres for local fresh milk.
- Local fresh milk sales in October had the lowest minimum daily sales at 108.5 litres. This could point to challenges such as lower demand or possible supply issues.

Interpretation:

1. **Stable Demand for Packaged Milk:** Packaged milk displays more stable and higher demand, displaying its preference among customers due to affordability and convenience.
2. **Variability in Local Fresh Milk Sales:** The higher variability in local milk sales, particularly in October, suggests increased sensitivity to factors such as price changes or availability. Targeted promotional campaigns and adjusting prices could help make sales more consistent and steady.
3. **Seasonal Decline in Local Milk:** The slight decline in local milk's total monthly sales and daily averages from May to October indicates the need for strategies to retain customers during this period.
4. **Price Elasticity:** The higher standard deviation for local milk sales in October could also point to price elasticity, where small price changes majorly impact consumer behaviour.

2.3.3 This analysis calculates retention and churn rates based on the number of customers retained, lost, and acquired between two periods.

Customer Retention and Churn Analysis	
Metric	Value
Total Customers	76
Retained Count	22
New Count	9
Lost Count	14
Retention Rate(in %)	69.73684211
Churn Rate(in %)	18.42105263

Fig 7. Customer Retention and Churn Analysis

Customer retention and churn analysis help evaluate loyalty, customer acquisition, and attrition rates. These metrics are important to understand the business's overall health and finding ways to improve customer satisfaction.

Key Metrics and Formulas:

a. Retention Rate

- **Purpose:** Retention rate measures the percentage of customers who continued purchasing milk in the following period. It indicates loyalty and recurring sales.
- **Formula:**

$$\text{Retention Rate (\%)} = \left(\frac{\text{Number of Retained Customers}}{\text{Total Customers}} \right) \times 100$$

- **Example Calculation: From the table:**

- Total Customers = 76
- Retained Customers = 22

$$\text{Retention Rate (\%)} = \left(\frac{22}{76} \right) \times 100 = 69.73\%$$

- **Interpretation:** A retention rate of 69.73% indicates that a significant portion of customers returned, demonstrating strong loyalty.

b. Lost Customer Count

- **Purpose:** Lost customer count measures the number of customers who stopped buying milk. It's important to understand churn and its root causes.
- **Formula:**

$$\text{Lost Customers} = \text{Total Customers from the Previous Period} - \text{Retained Customers}$$

- **Example Calculation:** From the table:
 - Lost Customers = 14

c. Churn Rate

- **Purpose:** Churn rate measures the percentage of customers who stopped purchasing milk. It reflects potential dissatisfaction or competition.
- **Formula:**

$$\text{Churn Rate (\%)} = \left(\frac{\text{Number of Lost Customers}}{\text{Total Customers}} \right) \times 100$$

- **Example Calculation:** From the table:
 - Lost Customers = 14
 - Total Customers = 76

$$\text{Churn Rate (\%)} = \left(\frac{14}{76} \right) \times 100 = 18.42\%$$

- **Interpretation:** A churn rate of **18.42%** suggests that nearly 1 in 5 customers stopped purchasing milk, highlighting the need for retention strategies.

d. New Customer Count

- **Purpose:** New customer count reflects the business's ability to attract new buyers and expand its customer base.
- **Formula:**

$$\text{New Customers} = \text{Total Customers in the Current Period} - \text{Retained Customers}$$

- **Example Calculation:** From the table:
 - Total Customers = 76
 - Retained Customers = 22

$$\text{New Customers} = 76 - 22 = 9$$

- **Interpretation:** Acquiring 9 new customers during the period indicates moderate success in reaching new markets or customers which can be improved a lot.

2.4 Business Implications

The descriptive analysis provides actionable insights:

1. **Price Sensitivity:** The more variability in fresh milk sales during October show that customers are very responsive to price changes. By setting stable prices or discounts during this time can help in retaining customers.
2. **Customer Loyalty:** A high churn rate shows us the need for loyalty programs or promotional campaigns to retain existing customers.
3. **Fresh Milk's Health Focus:** Fresh milk's nutritional and health benefits make it a unique feature. By telling people about these benefits through awareness campaigns, they can help attract health-conscious customers and build stronger loyalty.
4. **Improved Availability:** Expanding the availability of fresh milk beyond morning and evening hours could address customer convenience and help boost sales during off-peak times.

3. Results and Findings

This section presents the results of the analysis conducted on the sales data for Shyam Dairy, focusing on sales trends, customer preferences, retention and churn rates, and the performance of local versus packaged milk. Key insights are illustrated using tables, graphs, and charts for clarity and to support business recommendations.

3.1. Daily Sales Trends

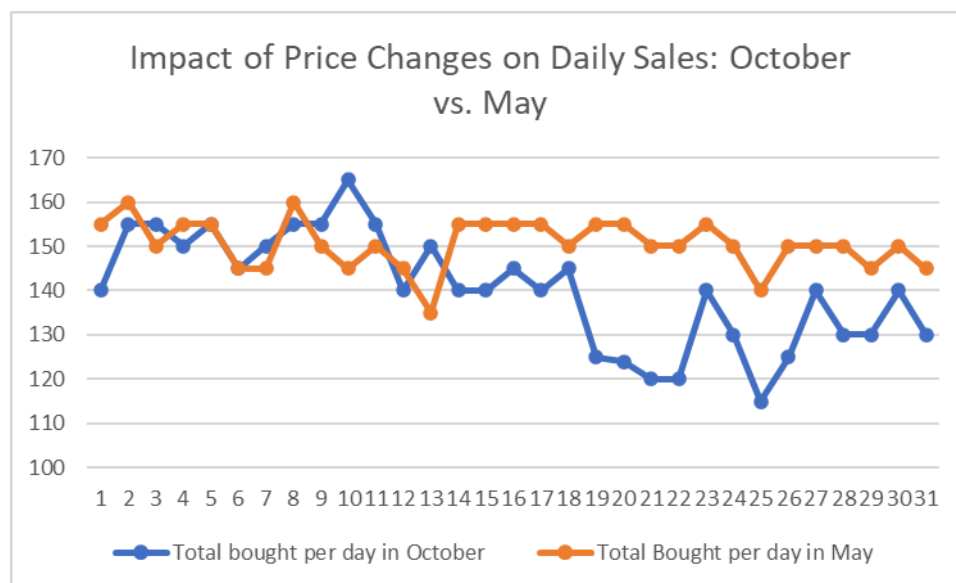


Fig 8. Impact of Price Changes on Daily Sales: October vs. May

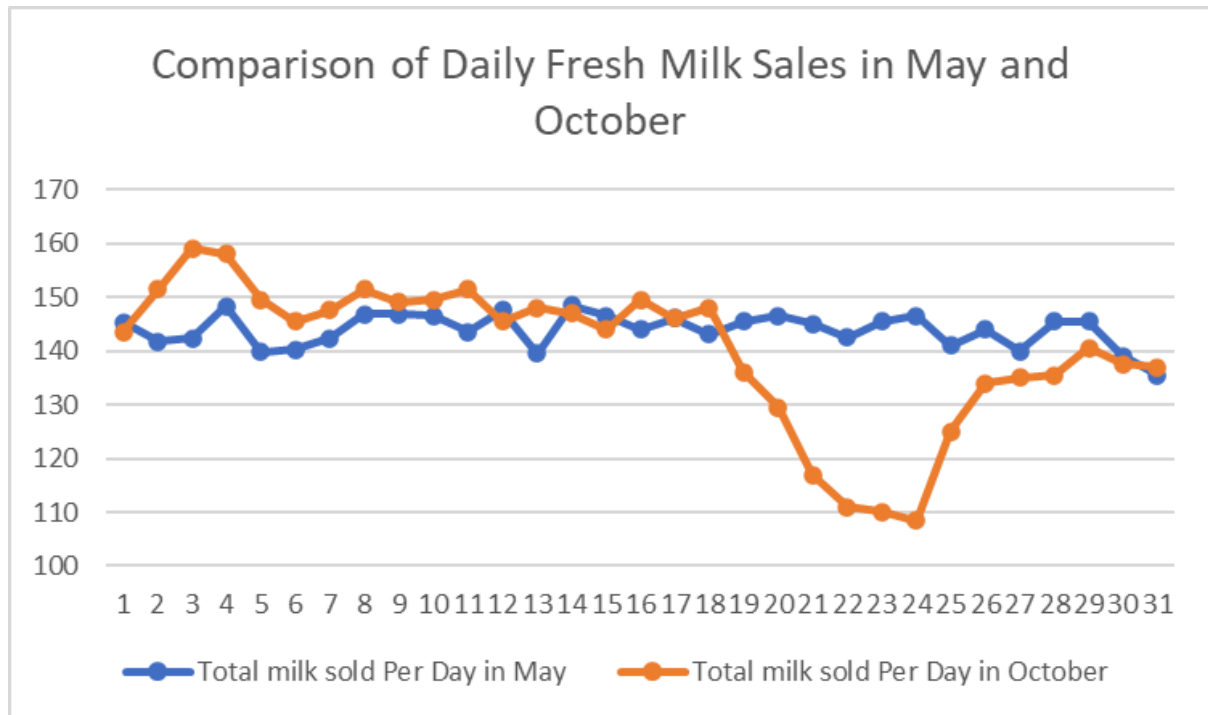


Fig 9. Comparison of Daily Fresh Milk Sales in May and October

Key Findings:

- **Stable Sales in May:** In May, daily sales were steady and consistent , which showed a stable demand pattern without much fluctuation.
- **Fluctuating Sales in October:** Sales in October were much less stable, with some days seeing sharp drops. This shows that demand was more unpredictable during this month.
- **Lower Average Sales in October:** On average, October had slightly lower daily sales compared to May, which clearly indicates a decline in demand.
- **Seasonal or Price-Driven Changes:** The ups and downs in October sales suggest that customers were more sensitive to price changes or other seasonal factors affecting their decisions.

Interpretation:

- **Price Sensitivity:**
The big differences in October sales are most likely linked to price changes. By giving discounts or keeping prices steady during this time could help to make the demand more stable.

- **Learning from May's Stability:**

May's steady sales provide a good idea. Using similar strategies, like better availability or promotions, one can make the October sales more stable.

- **Promotions to Boost Sales:**

For low demand days in October, special promotions or offers could attract more customers and help avoid further losing in demand. By focussing on fresh milk's health benefits during these promotions could also help to bring in more buyers.

- **Customer Retention is Key:**

The drop in October sales shows the need to focus on keeping regular customers. Loyalty programs, flexible pricing, or improved convenience could make customers stay even during times of change.

3.2.Monthly Total Sales Comparison

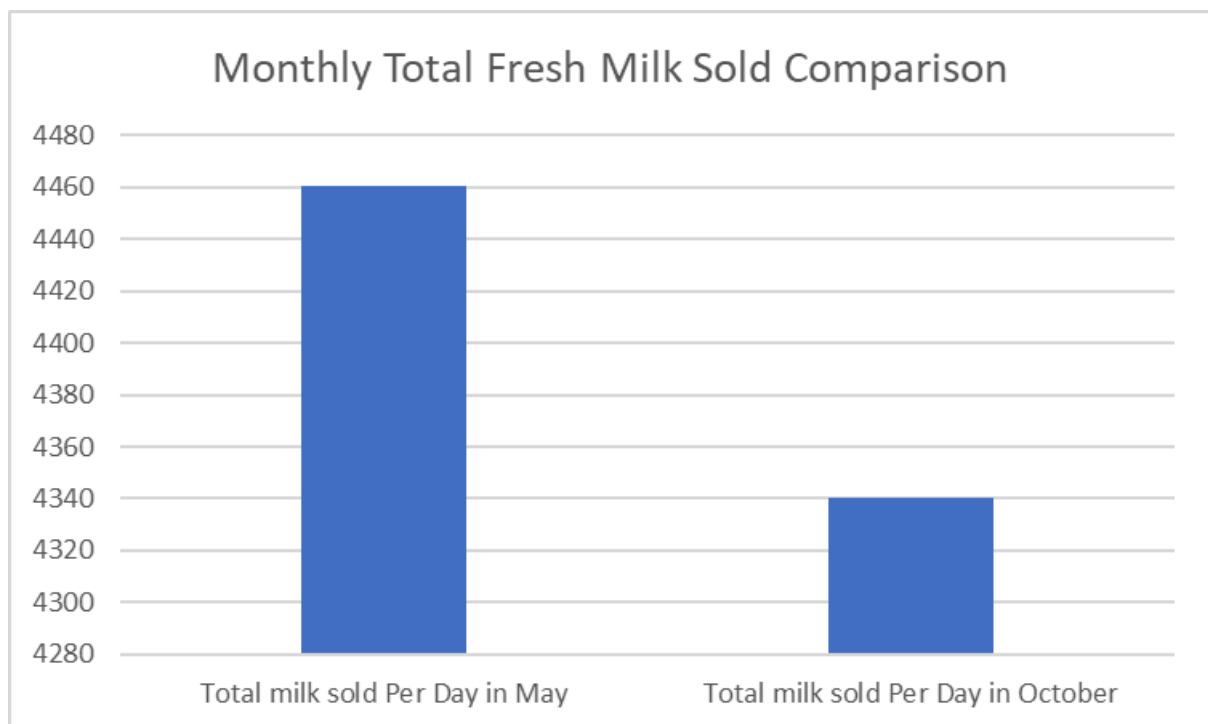


Fig 10. Monthly Total Fresh milk sold comparison

Key Findings:

1. Higher Sales in May: Total sales in May were higher than in October, showing stronger demand during that month.

2. **Packaged Milk Comparison:** Packaged milk consistently sold more than fresh milk across both months, which indicates more customer preference towards it.

Interpretation:

The drop in October's total sales shows a need to focus on keeping customers active and loyal during this period. Strategies like loyalty programs, better promotions, or emphasising the health benefits of fresh milk could help to fix this loss and bring sales back up.

3.3.Packaged Milk Sales Trends

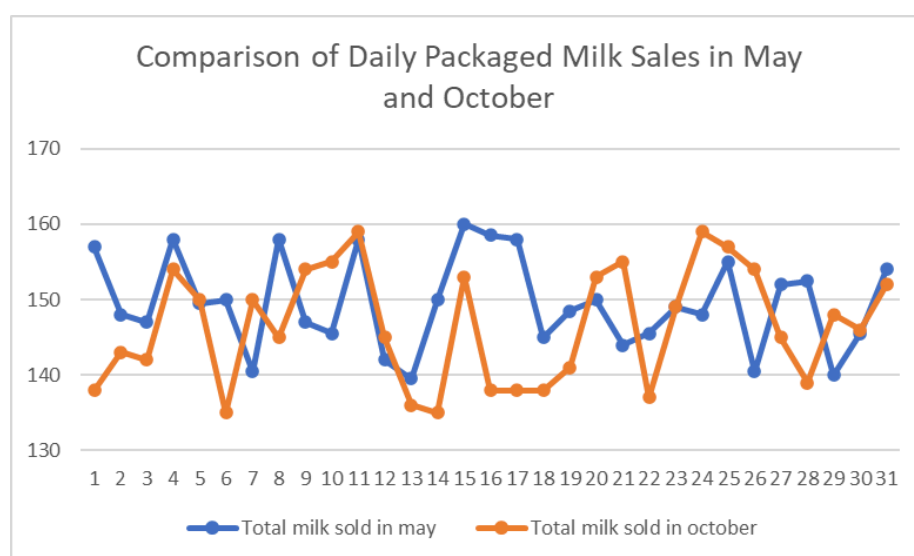


Fig 11. Comparison of Daily Packaged Milk sales in May and October

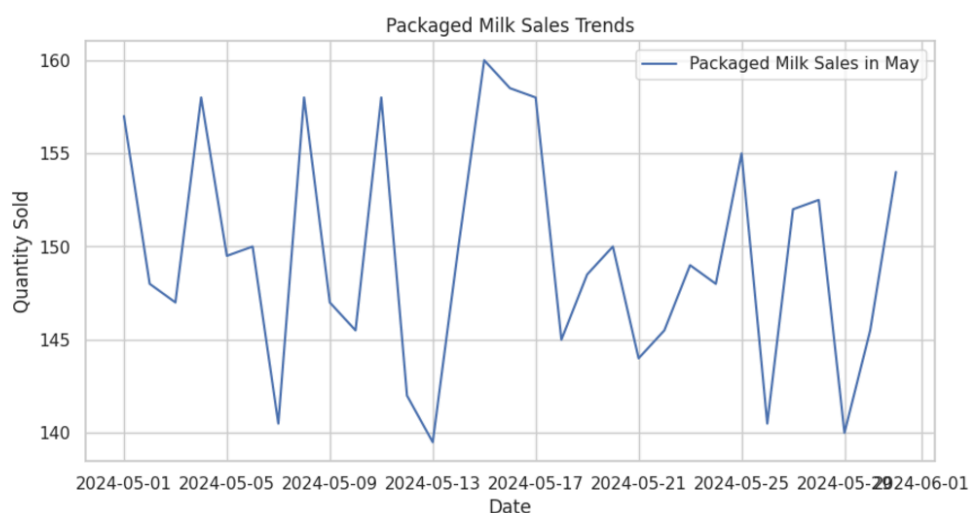


Fig 12. Packaged Milk sales trends in May

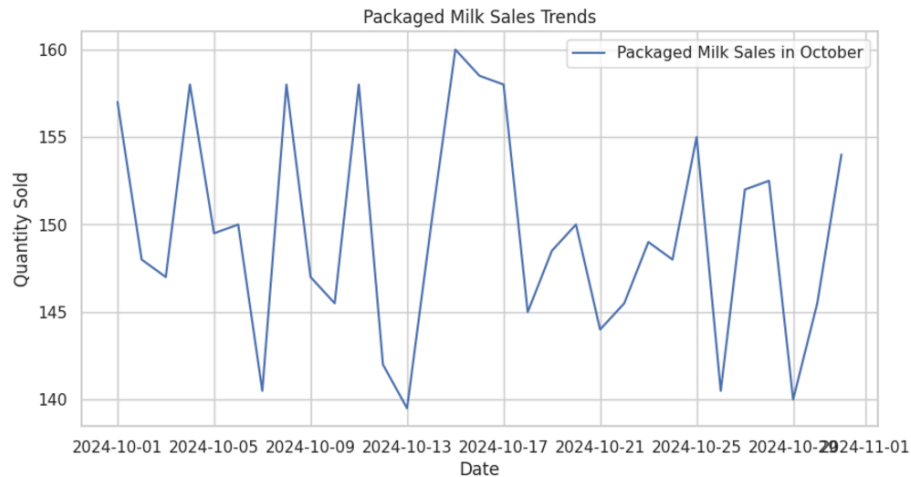


Fig 13. Packaged Milk sales trends in October

Key Findings:

1. **Stable Demand for Packaged Milk:** Packaged milk sales were more stable compared to fresh milk, showing consistent demand from customers from May to October.
2. **Slight Fluctuations in October:** While October had a few ups and downs in packaged milk sales, the overall trend remained stable, with no major changes in customer's behaviour.

Interpretation:

Packaged milk's steady sales show its strong popularity and lower sensitivity to price changes compared to fresh milk. The steady sales of packaged milk pose a concern and forces the business to focus more on boosting fresh milk sales by running campaigns that highlight its health benefits and quality.

3.4. Local Milk Sales Trends

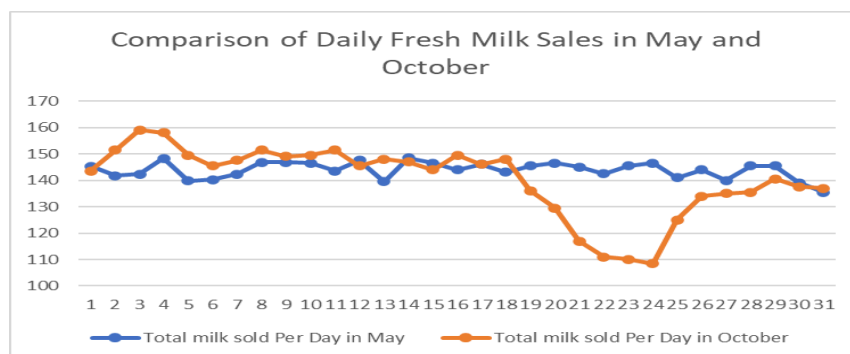


Fig 14. Comparison of daily Fresh Milk Sales in May and October

Key Findings:

1. Higher Variability in Local Milk Sales: Local milk sales were less stable compared to packaged milk, showing more ups and downs throughout May and October.
2. Dips in October Sales: October saw noticeable drops in daily local milk sales, suggesting that customers were likely influenced by factors like price changes or inconsistent availability.

Interpretation:

The ups and downs in local milk sales point to the need for focused efforts to make demand more stable. Targeted campaigns, especially during periods like October, could help address these dips by highlighting the health benefits of fresh milk and improving its availability.

3.5. Customer Retention and Churn Analysis

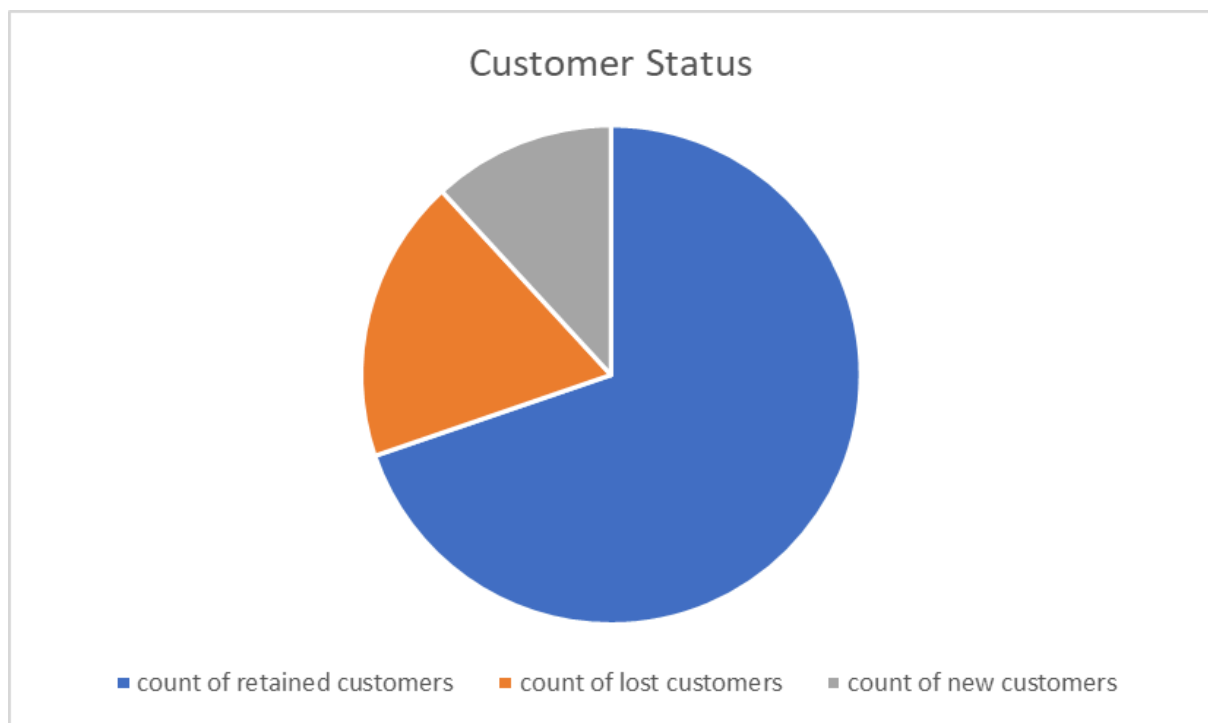


Fig 15. Customer Retention and Churn Analysis

Key Findings:

1. Strong Customer Retention: With a retention rate of **69.73%**, most customers remained loyal and continued purchasing milk.

2. Notable Churn Rate: The churn rate of **18.42%** highlights that a significant number of customers stopped buying milk during this period.
3. Negative Net Growth: The business **lost 14** customers but **gained only 9** new ones, resulting in an overall decline in the customer base.

Interpretation:

The high retention rate shows strong loyalty among existing customers, which is a positive sign. But, the churn rate and negative net growth highlight the need for strategies to retain more customers and attract new ones. Loyalty programs, better pricing, and improved customer engagement could help reduce churn and boost overall growth.

3.6. Fresh vs. Packaged Milk Sales Comparison

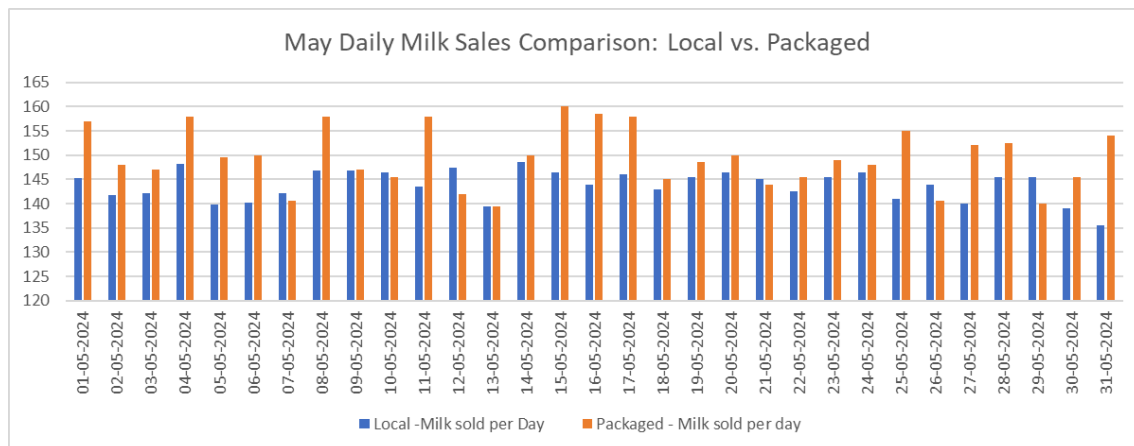


Fig 16. May Daily Sales Comparison: Local vs Packaged

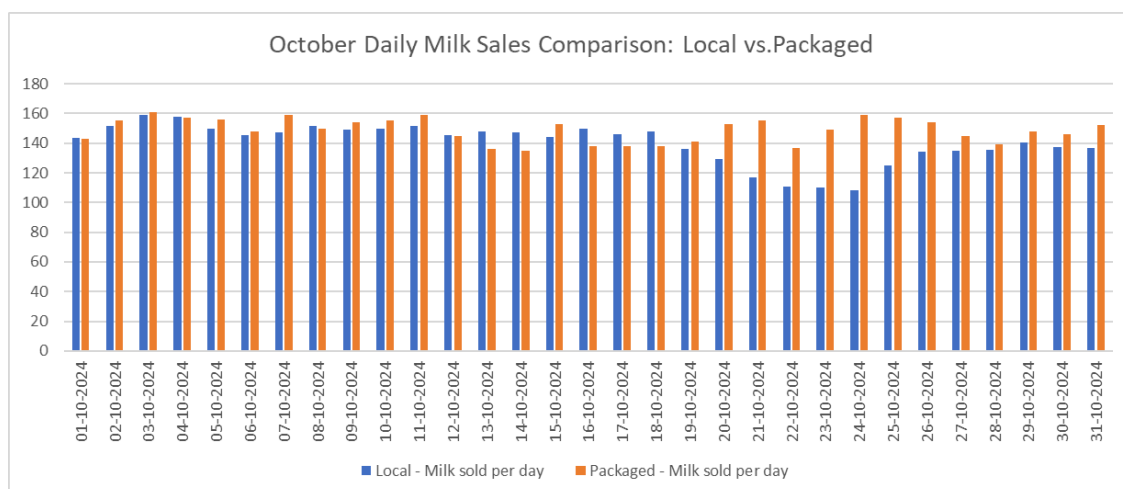


Fig 17. October Daily Sales Comparison: Local vs Packaged

Key Findings:

1. **Packaged Milk Dominance:** Packaged milk consistently outperformed fresh milk in terms of average sales, total sales, and overall stability during both May and October.
2. **Higher Variability in Fresh Milk Sales:** Fresh milk sales were more unpredictable, especially during October, showing greater fluctuations compared to packaged milk.

3.7. Business Implications:

Based on the findings:

1. **Stabilise Fresh Milk Sales:**
Use targeted promotions and discounts to reduce fluctuations in fresh milk sales, particularly during October when variability is higher.
2. **Enhance Customer Retention:**
Introduce loyalty programs to keep existing customers engaged and reduce the number of those who stop purchasing.
3. **Seasonal Campaigns for Fresh Milk:**
Launch focused campaigns during October to counter sales drops and encourage seasonal demand for fresh milk. Highlight its health benefits to attract health-conscious customers.

4. Interpretation of Results and Recommendations

4.1. Interpretation of Results

After the analysis of May and October sales data, we can see into the different insights of customer behaviour, product performance, and sales trends. These details provide a clear picture of Shyam Dairy's current market position and give direction for future plans.

- **Daily Sales Trends:** Fresh milk sales in October were more unpredictable when compared to May, which can be because of seasons and other factors like price adjusting, and customers changing their preferences. But, packaged milk sales remained steady, which showed stable demand.

- **Monthly Sales:** Both fresh and packaged milk had high sales in May than in October, but out of both, fresh milk had the most loss. This gives a chance to increase and improve October sales by using proper efforts.
- **Packaged vs. Fresh Milk:** Packaged milk's performance was better than fresh milk in terms of total sales, average daily sales, and stability. This tells us that customers are shifting more towards packaged milk options probably because of easiness and stable price.
- **Customer Retention and Churn:** With a **69.73%** retention rate, Shyam Dairy has a loyal customer base. But, the churn rate of **18.42%** and a loss in total customer growth shows areas for improvement in retaining customers and keeping them regular.
- **Price Sensitivity:** Fresh milk sales were more affected by price changes, which showed more ups and downs and less daily sales in October. But, packaged milk showed less difference, which clearly tells us its stable demand.

4.2. Recommendations

Based on these outcomes, the following steps are recommended by me to increase sales and customer satisfaction:

- **Boost Fresh Milk Sales:**
 - a. Offer discounts and promotions in October and in general to work with price sensitivity and encourage purchases.
 - b. Mention the health benefits and freshness of local milk by targeted marketing campaigns.
- **Enhance Customer Retention:**
 - a. Start loyalty programs to reward regular customers and encourage them coming back.
 - b. Use marketing based on people to people, and offer discounts or offers to loyal customers.
- **Reduce Churn:**
 - a. Collect feedback from customers to understand why they leave and understand their concerns or issues.
 - b. Do campaigns which focus on getting the lost customers back.
- **Seasonal Campaigns:**

- a. Create campaigns based on seasons, and focus on the benefits of fresh milk during the festive season.
 - b. Use data to predict high-demand periods and fill and store the inventory accordingly.
- **Expand Fresh Milk Strength:**
 - a. Expand and better the reach of fresh milk by increasing the distribution network.
 - b. Use strong efforts to let people know that fresh milk is a dependable choice.
- **Pricing Strategies:**
 - a. Stable the fresh milk prices to reduce customer loss and focus on increasing the demand and making it consistent.
 - b. Offer better price and offers during low-demand periods to attract the lost customers.

4.3. Business Implications

Implementing these strategies can have a great impact on Shyam Dairy's growth and operations:

- **Stabilising October Sales:** Promotions and price adjustments can help to work around the sales drop in October, which will help to have a more reliable revenue flow.
- **Building Customer Loyalty:** Good customer retention programs and reduced churn will help the dairy to customer satisfaction and help them achieve more profit as more time passes by.
- **Market Expansion:** By increasing fresh milk volume and reaching new areas, Shyam Dairy can tap into undiscovered areas and grow demand for fresh milk.
- **Operational Improvements:** Using various analytics and target campaigns will help with better resource management, which will help the dairy to keep right products and store whatever products are needed and whenever they are needed.

These steps will help Shyam Dairy not only overcome their current challenges but also position the business for long-term success.