

Data Optimised Strategies for an Agricultural Retail

An end-term report for BDM Capstone Project

Submitted by

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Declaration Statement

I am working on a Project titled **Data Optimised Strategies for Agricultural Retail**. I extend my appreciation to **Laxmi Khad Bhandar**, for providing the necessary resources that enabled me to conduct my 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 analysed to assure its reliability.

Additionally, I affirm that all procedures employed for the purpose of data collection and analysis have been duly explained in this report. The outcomes and inferences derived from the data are an accurate depiction of the findings acquired through thorough analytical procedures.

I am dedicated to adhering to the principles of academic honesty and integrity, and I am receptive 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. I thus affirm that I am not engaged in any form of collaboration with other individuals, and that all the 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 taken up towards course fulfilment in the BS

Degree Program offered by IIT Madras. The institution does not endorse any of the claims or comments.

Signature of Candidate: 

Name: Yash Kumar

Date: 19 January 2024

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1.Executive Summary and Title

Laxmi Khad Bhandar, established in 1987 by Mr. Rajendra Chauhan, is a well-known farm shop that specialising in offering a diverse range of farm essentials including but not limited to shovels, seeds, and fertilizers. Despite, its long presence and a bright past, the shop is now facing challenges related to profit and inventory management. These challenges have been existing for over a year now, with most of them linked to decay of seeds.

The project focuses on understanding the causes behind these fiscal losses and enhancing sales. The primary objective of our project is to increase net profit, determining ideal purchase time thus, optimizing inventory and finally streamlining flow of goods.

We will be tackling these issues with a through analysis making use of the following strategies:

- Utilization of time series charts such as line chart.
- Using various Excel functions to predict and analyse sales data, resulting in better planning and decision making.
- Using pivot tables which help in analysing data in detail.

Expected outcome for this project includes a noticeable improvement in profits and a reduction in wastage through effective implementation of strategies.

2. Detailed Explanation of Analysis Process/Method

2.1 Preparing data for analysis.

The sale records for Laxmi Khad Bhandar were originally in the form of a pdf. They have been utilizing pdfs ever since the business got GST registered. These reports are periodically sent for review. I extracted this data into an Excel spreadsheet which was later used for analysis.

The below image represents raw pdf.

| Laxmi Khad Bhandar New Colony Begum Sarai, Afzalgarh Bijnor, 246722 GSTIN : 09AMLPS7605Q1Z1 List of Sales Vouchers | | | | | | | | | |
|--|------------|-------------|------------------|---------------|-----------------------------|---------|--------|-----------|------------|
| Voucher Series : All | | | | | From 1-7-2023 to 31-10-2023 | | | | |
| S.No. | Date | Vch/Bill No | Particulars | TIN/GSTIN No. | Item Details | Qty. | Unit | Price | Amount |
| 1. | 01-07-2023 | 144 | F.S NAWABGANJ | | FERTERRA 4 KG | 84.000 | Kgs. | 200.000 | 16,800.000 |
| 2. | 02-07-2023 | 145 | Cash | | 6444 ARAZIE 3 KG | 100.000 | Kgs. | 361.000 | 36,100.000 |
| 3. | 03-07-2023 | 146 | F.S NAWABGANJ | | CUSTODIA 1 LTR | 3.000 | Litres | 3,110.000 | 9,330.000 |
| | | | | | FERTERRA 4 KG | 32.000 | Kgs. | 200.000 | 6,400.000 |
| 4. | 03-07-2023 | 147 | Cash | | ARIZE 6129 GOLD LOC 3 KG | 100.000 | Kgs. | 323.000 | 32,300.000 |
| 5. | 04-07-2023 | 148 | Cash | | 6444 ARAZIE 3 KG | 130.000 | Kgs. | 361.000 | 46,930.000 |
| 6. | 05-07-2023 | 149 | Cash | | 6444 ARAZIE 3 KG | 130.000 | Kgs. | 361.000 | 46,930.000 |
| 7. | 06-07-2023 | 150 | F.S NAWABGANJ | | CUSTODIA 1 LTR | 2.000 | Litres | 3,110.000 | 6,220.000 |
| | | | | | MAINSUL 3 KG | 72.000 | Kgs. | 130.000 | 9,360.000 |
| 8. | 07-07-2023 | 151 | Cash | | 6444 ARAZIE 3 KG | 120.000 | Kgs. | 361.000 | 43,320.000 |
| 9. | 08-07-2023 | 152 | UPI PAYMENT | | ARIZE 6129 GOLD LOC 3 KG | 50.000 | Kgs. | 323.000 | 16,150.000 |

Fig 2.1 Raw Sales Data

The excel spreadsheet derived from this data contains more than 120 rows tracking more than 20 items, most of them being pesticides and insecticides.

Below snapshot represents data in form of a spreadsheet.

| S.No. | Date | Vch/Bill No | Particulars | TIN/GSTIN No. | Item Details | Qty. | Unit | Price | Amount |
|-------|------------|-------------|------------------|---------------|---|---------|--------|-----------|-------------|
| 1. | 01-07-2023 | 144 | F.S NAWABGANJ | | FERTERRA 4 KG | 84.000 | Kgs. | 200.000 | ₹ 16,800.00 |
| 2. | 02-07-2023 | 145 | Cash | | 6444 ARAZIE 3 KG | 100.000 | Kgs. | 361.000 | ₹ 36,100.00 |
| 3. | 03-07-2023 | 146 | F.S NAWABGANJ | | CUSTODIA 1 LTR | 3.000 | Litres | 3,110.000 | ₹ 9,330.00 |
| 4. | 03-07-2023 | 147 | Cash | | ARIZE 6129 GOLD LOC 3 KG | 100.000 | Kgs. | 323.000 | ₹ 32,300.00 |
| | 06-07-2023 | | | | MAINSUL 3 KG | 72.000 | Kgs. | 130.000 | ₹ 9,360.00 |
| 12. | 10-07-2023 | 155 | Cash | | FERTERRA 7.5KG | 200.000 | Kgs. | 161.000 | ₹ 32,200.00 |
| 13. | 11-07-2023 | 156 | UPI PAYMENT | | SHAMIR 500 ML | 43.000 | Litres | 855.000 | ₹ 36,765.00 |
| | 12-07-2023 | | | | NARKIS 100 ML | 3.000 | Litres | 3,728.000 | ₹ 11,184.00 |
| 15. | 13-07-2023 | 158 | Cash | | 2,4-D MAIN 400 ML | 100.000 | Litres | 313.500 | ₹ 31,350.00 |
| 16. | 14-07-2023 | 159 | Cash | | LAPIDOS 4 KG (CHLORANTRANILIPROLE 0.4%) | 255.000 | Kgs. | 127.862 | ₹ 32,604.81 |
| | 17-07-2023 | | | | MAINSUL 1 KG | 53.000 | Kgs. | 130.000 | ₹ 6,890.00 |
| 21. | 19-07-2023 | 164 | Cash | | UTTAM DAP (50 kg) | 23.000 | Bag | 1,100.000 | ₹ 25,300.00 |
| 23. | 21-07-2023 | 166 | UPI PAYMENT | | GILARDO 33.6SC 30 ML | 1.000 | Litres | 1,800.000 | ₹ 41,800.00 |

Fig 2.2 Sales Data as Spreadsheet

We can calculate the total sales revenue using items sold and their respective prices using the formula below:

$$\text{Total Sales Revenue} = \sum_{i=1}^n (\text{Items Sold}_i \times \text{Item Price}_i)$$

| | | | | Total Sales Per Day |
|-------|------------|-------------|-----------------------|---------------------|
| Sr No | Date | Total Sales | Total Quantities Sold | |
| 1 | 01-07-2023 | 16800 | 84 | |
| 2 | 02-07-2023 | 36100 | 100 | |
| 3 | 03-07-2023 | 48030 | 135 | |
| 4 | 04-07-2023 | 46930 | 130 | |
| 5 | 05-07-2023 | 46930 | 130 | |
| 6 | 06-07-2023 | 15580 | 74 | |
| 7 | 07-07-2023 | 43320 | 120 | |
| 8 | 08-07-2023 | 59470 | 170 | |
| 9 | 09-07-2023 | 16800 | 84 | |
| 10 | 10-07-2023 | 32200 | 200 | |
| 11 | 11-07-2023 | 36765 | 43 | |
| 12 | 12-07-2023 | 16904 | 47 | |
| 13 | 13-07-2023 | 31350 | 100 | |

Fig 2.3 Daily sales data with quantities

2.2 Calculating profits.

The main concerns of Laxmi Khad Bhandar are linked to irregularities and decrease in profits. Hence, it is vital for us to calculate profits.

The below snapshot is from the Excel spreadsheet where I have calculated **profits** and **profits percentage** using the following formula.

$$\text{Profit per SKU} = \text{Revenue per SKU} - \text{Cost per SKU}$$

$$\text{Share of Profit per SKU} = (\text{Profit per SKU} / \text{Total Profit}) * 100\%$$

| Sr No | Item Name | Buying Price | Selling Price | Profit | Profit Percentage |
|-------|--|--------------|---------------|---------|-------------------|
| 1 | FERTERRA 4 KG | 179.7 | 200 | 20.3 | 10.15 |
| 2 | 6444 ARAZIE 3 KG | 305.48 | 361 | 55.52 | 15.37950139 |
| 3 | CUSTODIA 1 LTR | 2389.15 | 3110 | 720.85 | 23.17845659 |
| 4 | ARIZE 6129 GOLD LOC 3 KG | 255.8 | 323 | 67.2 | 20.80495356 |
| 5 | MAINSUL 3 KG | 97.44 | 130 | 32.56 | 25.04615385 |
| 6 | FERTERRA 7.5KG | 136.41 | 161 | 24.59 | 15.27329193 |
| 7 | SHAMIR 500 ML | 714.75 | 855 | 140.25 | 16.40350877 |
| 8 | NARKIS 100 ML | 2720.85 | 3728 | 1007.15 | 27.01582618 |
| 9 | 2,4-D MAIN 400 ML | 228.94 | 313.5 | 84.56 | 26.97288676 |
| 10 | LAPIDOS 4 KG (CHLORANTRANLILIPROLE 0.4%) | 110.15 | 127.862 | 17.712 | 13.85243466 |
| 11 | MAINSUL 1 KG | 103.69 | 130 | 26.31 | 20.23846154 |
| 12 | UTTAM DAP (50 kg) | 971.41 | 1100 | 128.59 | 11.69 |
| 13 | GIL ARD0 33 6SC 30 ML | 1278.73 | 1800 | 521.27 | 28.95944444 |

Fig 2.4 Profits and Profit Percentages for various items.

2.3 Fixed Cost Analysis

Fixed Cost analysis involves identifying and examining costs that remain constant irrespective of changes in production and sales. They typically include rent, electricity bills, insurances.

This analysis is important as it helps us understand minimum revenue needed every month and helps project fiscal more confidently.

Calculation involved cost, depreciation of all the spendings and their respective depreciation rates.

Below snapshot shows the table in detail.

| Fixed Cost Analysis | | | | | |
|---------------------|----------------------|-------------|-------------|-------------------|------------|
| Sr No | Spend At | Cost | Deprication | Depriciation Rate | Proportion |
| 1 | Electricity Bill | ₹ 1,536.43 | ₹ 1,536.43 | 100% | 2.14 |
| 2 | Sacks and Carry Bags | ₹ 2,891.00 | ₹ 2,891.00 | 100% | 4.02 |
| 3 | Transport | ₹ 15,000.00 | ₹ 15,000.00 | 100% | 20.85 |
| 4 | Insurances | ₹ 4,000.00 | ₹ 4,000.00 | 100% | 5.56 |
| 5 | Furniture | ₹ 48,500.00 | ₹ 2,425.00 | 5% | 67.43 |
| | | Total Cost | ₹ 71,927.43 | | |

Fig 2.5 Fixed Cost Analysis.

3. Results and Findings

3.1 Analysing Daily Earnings

I have plotted the daily sales data on a line graph, as shown below.

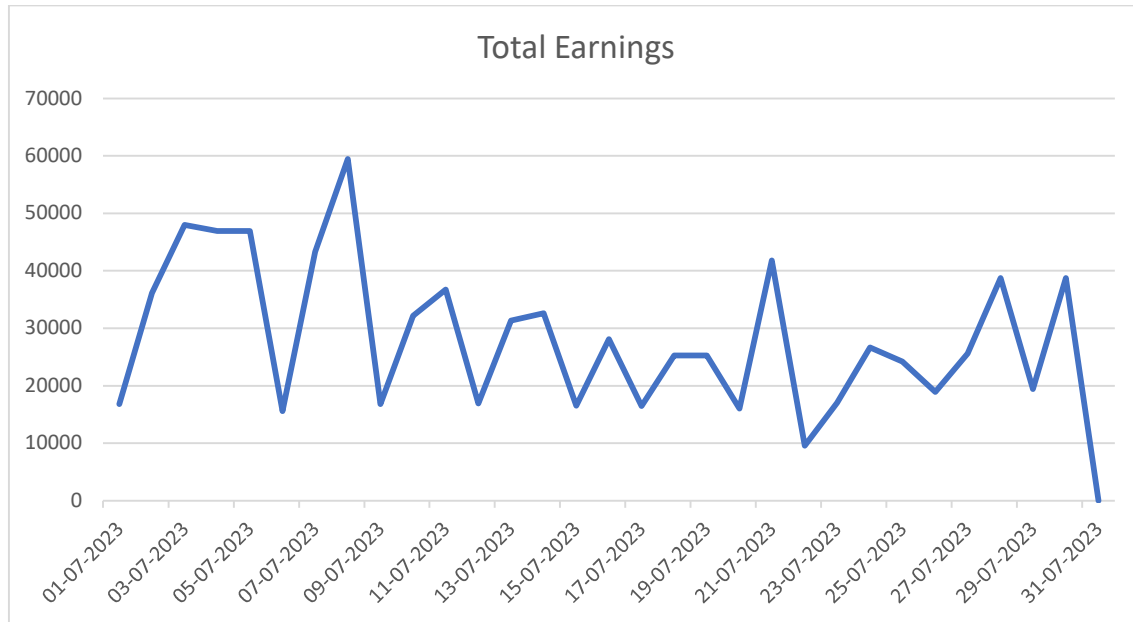


Fig 3.1 Daily Earnings Line Chart

The following can be inferred from this graph.

- We can observe a trend in the graph where the earnings gradually increase from beginning of month,
- This trend has a tendency of peaking in mid of the month and then decreasing as the month proceeds.
- Days with low sales like 22-07-2023 and 31-07-2023 with respective earnings as ₹9600 and ₹0 may indicate issues such as stock depletion and operational issues.
- The minimum and maximum revenue stand at ₹0 and ₹87613, giving us a range of ₹87613.

Formula for Range = max – min

3.2 Discovering Revenue with Charts

The below pareto chart utilizes our data to represent total revenue for best performing SKUs.

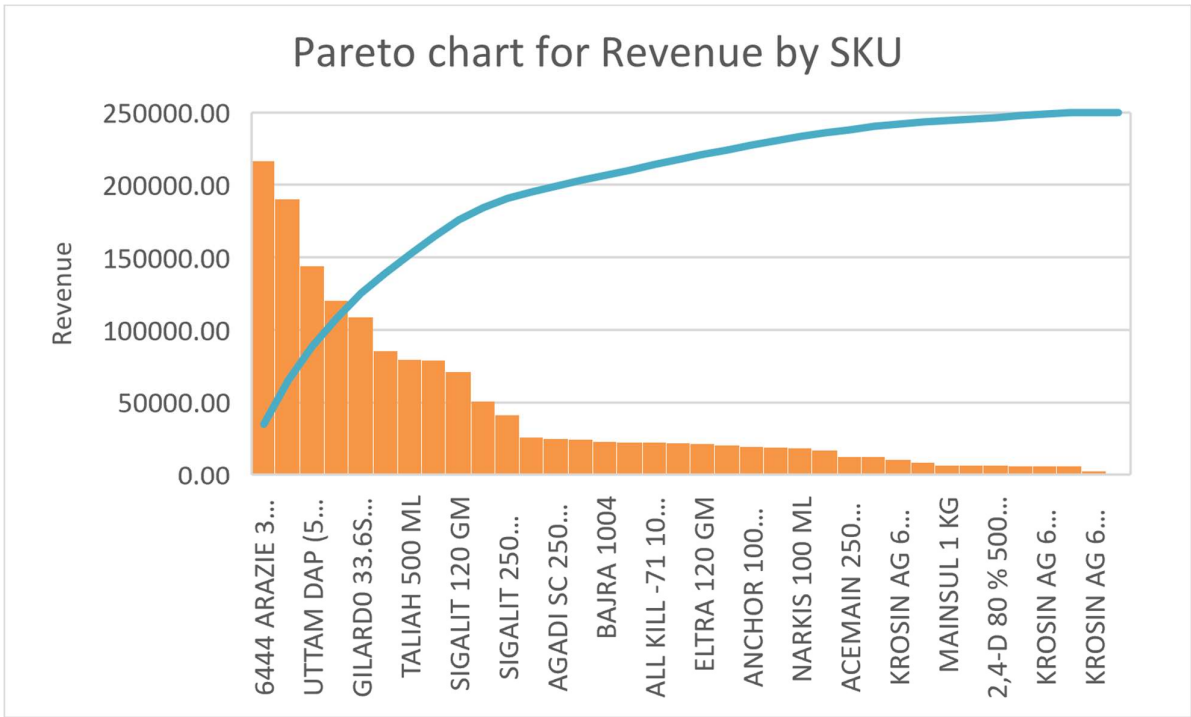


Fig 3.2 Pareto Chart for revenue produced by each SKU.

The above chart clearly depicts the following information.

- Items such as **6444 ARAZIE 3 KG** and **LAPIDOS 4 KG** are major contributors to total revenue.

Moreover, I have created pie chart showing the 6 most sold products.

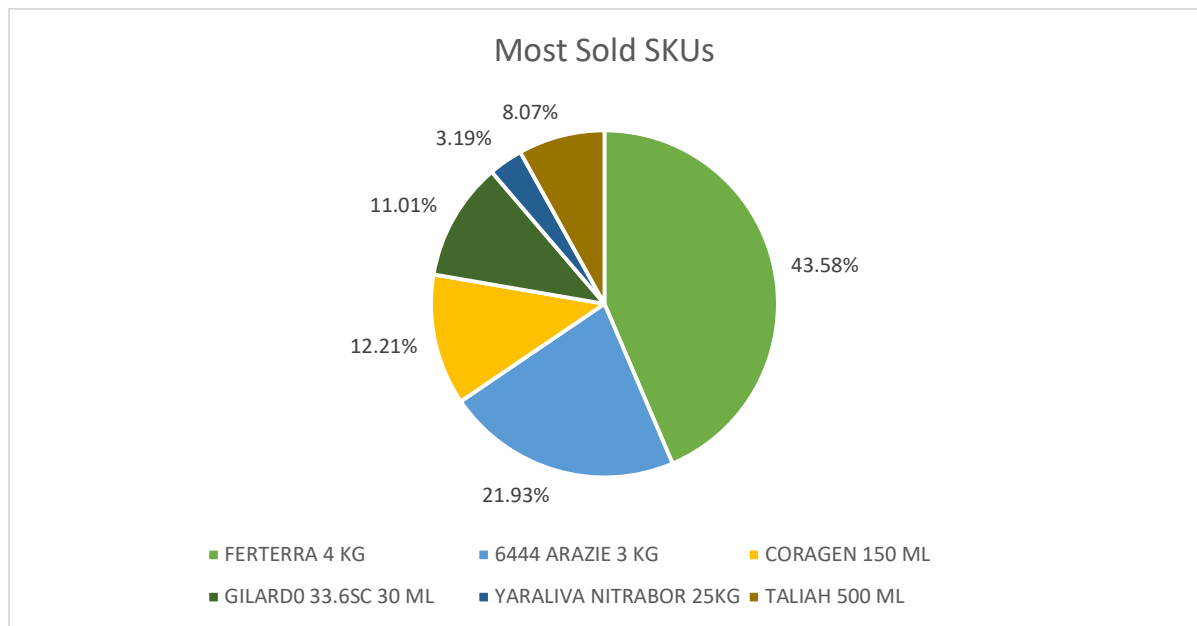


Fig 3.3 Proportions of Most Sold SKUs

The above chart reveals the following insights:

- Items such as **FERTERRA 4KG** along with **GILARD0 33.6SC 30 ML** and **6444 ARAZIE 3 KG** contribute significantly to the total sales.
- Even though **FERTERRA 4KG** is a minor contributor to total revenue, it still leads as the most important SKU in terms of sales.

3.2 Profit Loss Analysis

The below graph shows the comparison between buying and selling prices for 10 most profitable products.

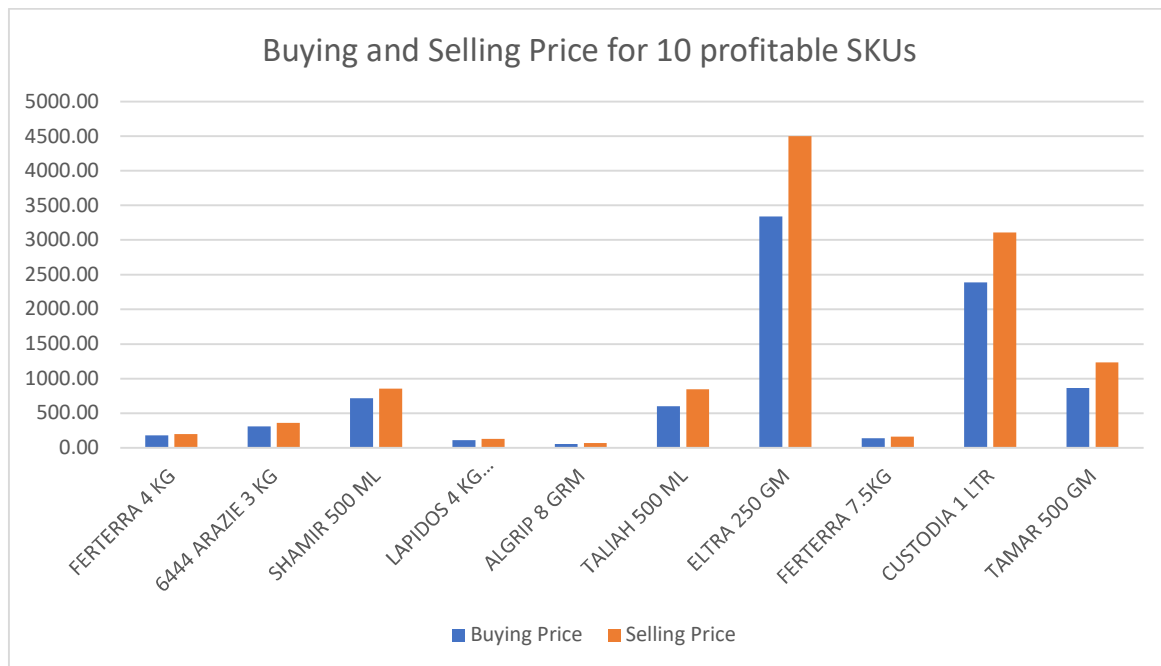


Fig 3.4 Buying and selling prices for top 10 profitable products.

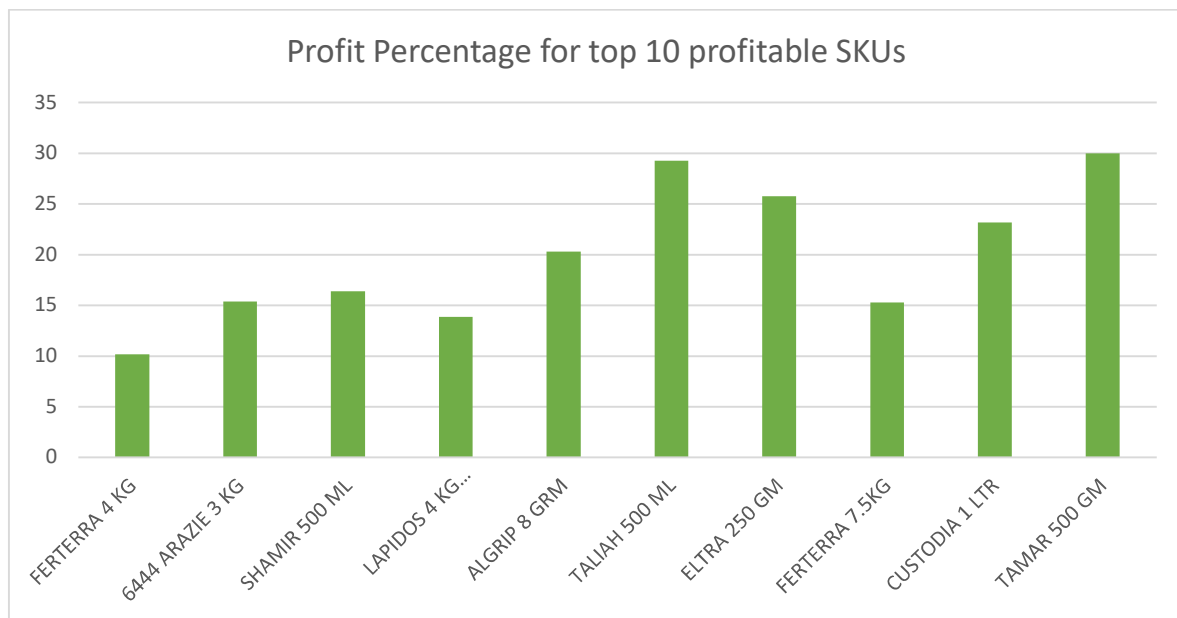


Fig 3.5 Profits per unit for top 10 profitable products

From this graph the below points can be inferred:

- Items with higher selling prices generally have higher profit margins. For example, **ELTRA 250 GM** is a highly priced item.
- There exists substantial difference between its buying and selling price leading to potentially higher margins for the seller.
- Other products such as **CUSTODIA 1 LTR**, **TAMAR 500GM** exhibit similar properties and are vital for a healthy income.

3.3 Insights from Fixed Cost Analysis

| Fixed Cost Analysis | | | | | |
|---------------------|----------------------|-------------|--------------|-------------------|------------|
| Sr No | Spend At | Cost | Depreciation | Depreciation Rate | Proportion |
| 1 | Electricity Bill | ₹ 1,536.43 | ₹ 1,536.43 | 100% | 2.14 |
| 2 | Sacks and Carry Bags | ₹ 2,891.00 | ₹ 2,891.00 | 100% | 4.02 |
| 3 | Transport | ₹ 15,000.00 | ₹ 15,000.00 | 100% | 20.85 |
| 4 | Insurances | ₹ 4,000.00 | ₹ 4,000.00 | 100% | 5.56 |
| 5 | Furniture | ₹ 48,500.00 | ₹ 2,425.00 | 5% | 67.43 |
| | | Total Cost | ₹ 71,927.43 | | |

Fig 3.5 Fixed Cost Analysis

The above table yields the following information:

- The fixed costs are categorized into different components, such as Electricity Bill, Sacks and Carry Bags, Transport, and Insurances.
- Unlike other components with a 100% depreciation rate, Furniture has a lower depreciation rate of 5%.
- This indicates a longer life for furniture making it a more substantial asset.

The proportions for fixed cost can be found below.

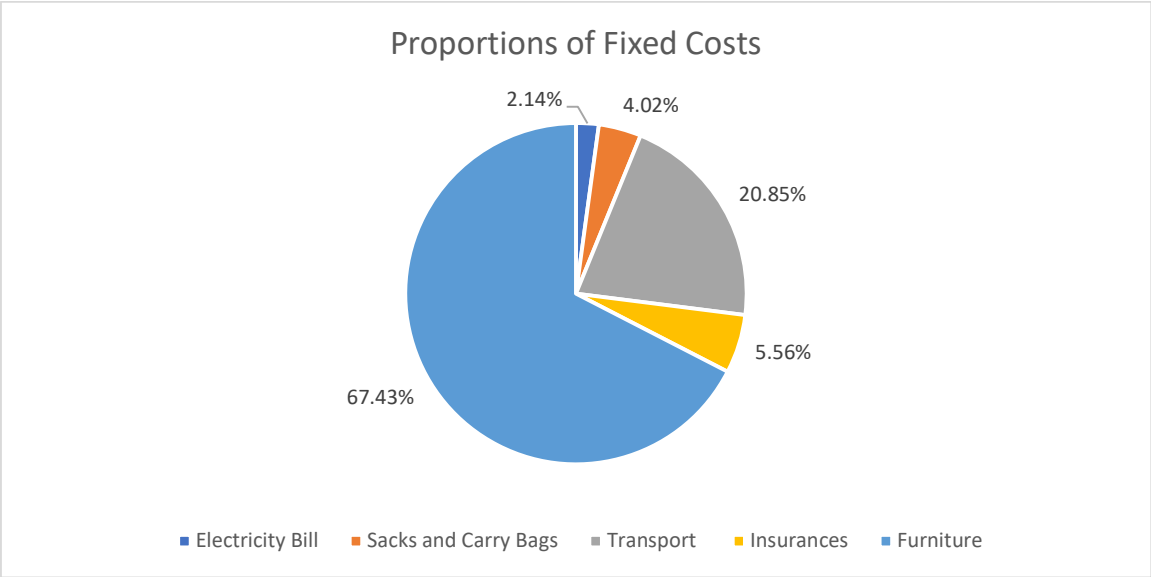


Fig 3.6 Proportions for Fixed Cost.

4. Interpretation of Results and Recommendation

The business can implement the following suggestions and strategies to improve sales and total revenue.

4.1 Bundling Items

- It has been observed that the products with high revenue generally have higher profit margins.
- Products can be grouped into bundles, which contain a highly priced item along with a complementary product at discounted prices.
- A customer is more likely to choose bundled option rather than individual items.

4.2 Limited Time Deals

- Limited time deals can be introduced creating a sense of urgency for the customer, which may lead to quick sales boosting overall sales.
- Limited time deals help create a scarcity driving customers to take immediate action. It is one of the most used strategies in business.

4.3 Loyalty Programs

- The business can also introduce a loyalty program where customers earn points and discounts based on their purchase value and how often they purchase.
- This will help create a sense of exclusivity and help build a healthy long-term relationship between the business and customers.

4.4 Community Activities

- The business can conduct information sessions whereby they educate prospective customers about the benefits of using such products.
- This can be done through a variety of channels. Educated customers are more likely to understand value of a product.
- The business can also focus on supplying small quantities of items whereby customers can test them, this will help create a sense of trust among customers.

4.5 Customer Feedback and Improvements

- A feedback system can be implemented wherein customers are regularly asked to rate their experience.
- This feedback should regularly be analysed.

4.6 E-commerce Integration

- Platforms like Flipkart and Amazon should be used to tap into a broader market.
- The business can also work towards developing an app or a website enabling customer to access stores at all the times.

4.7 Demand based pricing

- The business should regularly adjust prices according to the demand and customer behaviour.
- For example, prices can be lowered during off-season.

5. Presentation and legibility of the report

Link for Presentation:

<https://docs.google.com/presentation/d/1414qN2EpKyuWv-95DmD9-s-4nfL22Wy/edit?usp=sharing&ouid=106000101142158471943&rtpof=true&sd=true>

Link for Spreadsheet:

https://docs.google.com/spreadsheets/d/1jEhPQ_MLLb1SeKxEYLQRCvvg4olh5nxI/edit?usp=sharing&rtpof=true&sd=true

Thanks for Reading
