

BUSINESS DATA MANAGEMENT

— Final Submission —

ANALYSIS OF SALES AND MANUFACTURING COSTS FOR AN FMCG COMPANY

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Executive Summary

The Capstone Project in Business Data Management was a culmination of the students' academic training and their practical application in a real-world setting. The project provided them with the opportunity to demonstrate their knowledge and skills in data management, analysis, and presentation. The project's primary objective was to analyze the sales and manufacturing costs of a small-scale namkeen manufacturer and provide business solutions to improve demand forecasting and sales.

The first phase of the project involved selecting and convincing a business organization to provide data for analysis. This stage was crucial as it determined the project's feasibility and success. Identifying a suitable organization that was willing to provide the necessary data and collaborate with us throughout the project. The selected organization was a small-scale namkeen manufacturer that had been facing challenges in demand forecasting, production planning, and cost management.

The project was divided into three parts: the proposal, mid-term report, and final report, followed by a presentation. The proposal report consisted of the background of the organization and the problem statement based on data. The mid-term report involved data exploration using data analysis tools in Excel and Google Colab, descriptive statistics studies to identify the reason behind the problems, and probable solutions. The final report delved deeper into the analysis to identify the root cause of the problems, which included the purchase of raw materials, worker management, and optimal packaging size of the product based on demand in the market. The report provided recommendations to the organization, which were first assumed with respect to data and then converted into language that could be easily explained to the owner. This was done under the interpretation of the results section.



One of the significant challenges faced during the project was the missing data. However, I was able to obtain the missing data with the cooperation of the institution's letter and the manufacturer, and the analysis was completed within the given timeline. The data analysis revealed patterns, trends, and correlations that provided insights into the company's operations and identified areas where improvements could be made.

The findings of the project were presented to the manufacturer, and the business solutions recommended were discussed. The recommendations included optimizing production processes, reducing manufacturing costs, and improving demand forecasting and sales. The recommendations were based on the data analysis and aimed to help the organization improve its operations and profitability.

The project provided valuable experience in dealing with real-world data and business challenges. Also the importance of collaboration and communication in obtaining missing data and resolving issues that may arise during the project. The project also helped in developing critical thinking and problem-solving skills, which are essential in the field of data management.

In conclusion, the Capstone Project in Business Data Management was an excellent opportunity for us to apply our knowledge and skills in a real-world setting. The project allowed us to gain hands-on experience in data cleaning, preprocessing, and analysis. The project's success was due to the collaboration and communication between the students, the institution, and the manufacturer. The project's findings provided the manufacturer with valuable insights into their operations and recommendations on how to improve their business processes. The project's experience was valuable for the students' professional development and prepared them for future challenges in the field of data management.

Detailed Analysis

Analyzing SKU Sales and Recommending a Strategic Shift:

In-depth examination of sales data has revealed a significant discrepancy between the pocket-sized pack and the standard 500g pack, resulting in the company's reliance on a single SKU. Despite the seasonal boost in sales of the larger 3kg pack during the wedding season, the pocket pack's sales remain steady, accounting for around 60% of total sales. However, the pocket pack is also the most time-consuming and least profitable due to its small size, leading to high packaging and labor costs. The fixed market price of Rs 10 for the pocket pack leaves no room for price adjustments, making weight adjustment the only way to manage demand fluctuations. To reduce the company's dependence on a single SKU and increase profits, introducing a new SKU between the pocket and standard sizes is recommended.

Utilizing advanced analytical tools such as MS Excel pivot functionality and data science toolkits, a table was created that presents the total sales in each month, along with the breakdown of sales by SKU. This table confirmed that the majority of revenue is generated by the small pocket packs, despite their time-consuming packaging process, while the 500g regular pack contributes the least. On the other hand, sales of the 1kg and 3kg packs are performing well.

Row Labels	Sum of 3 kg pack	Sum of 1 kg pack	Sum of Pocket packs	Sum of 500g pack
Apr	336	319	1054	128
May	792	444	2268	232
Jun	582	626	2272	281
Grand Total	1710	1389	5594	641

Figure 1: Total Sales Breakdown in different SKUs

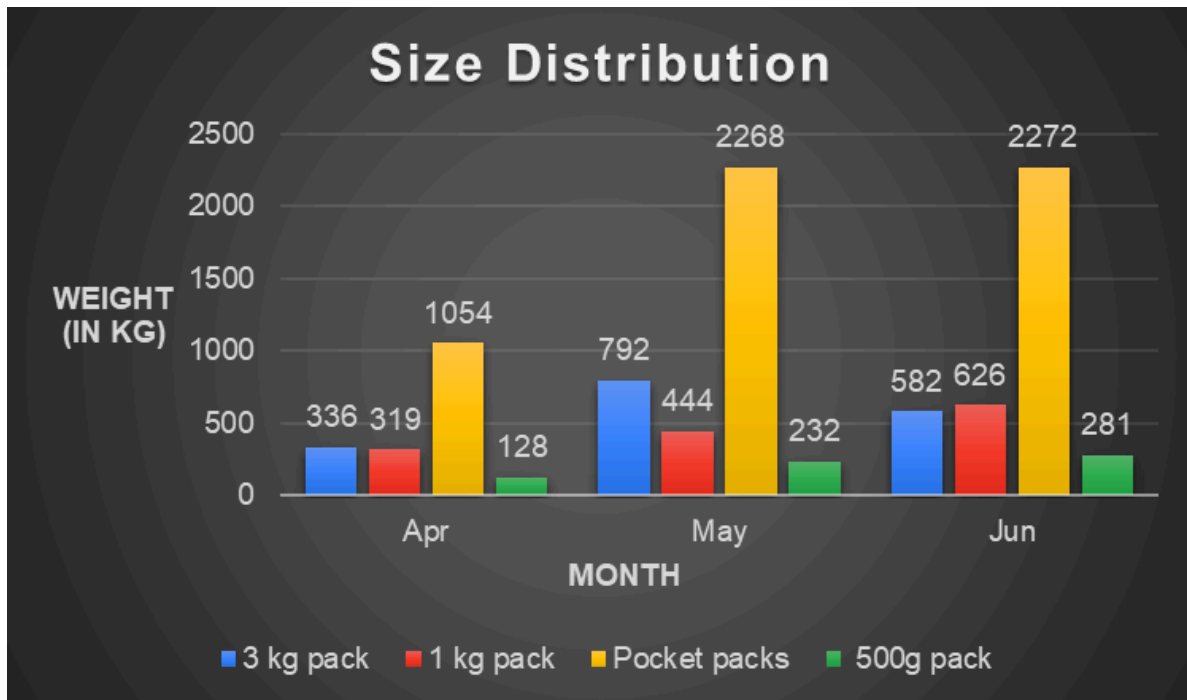


Figure 2: Bar Chart representing total sales distribution in different sizes

To achieve greater market share and profitability, the company needs to consider diversifying its product line by introducing a new SKU size that bridges the gap between the pocket and standard packs. This move could help balance the sales distribution and reduce the workload required for the pocket packs, while offering consumers more options and increasing overall sales. By using advanced analytics, the company can make informed decisions about product line diversification and ensure long-term success.

Overcoming Production Inefficiencies through Skilled Contract Labor:

In the current manufacturing setup of the company, production is not matching up with sales due to several reasons. The company has 7-8 days available for manufacturing, and their average daily production in each month ranges from 450 kg to 550 kg. This has been attributed to suboptimal capital investment and a shortage of trained workforce. Currently, the organization relies on different laborers for different work, leading to a production process that is entirely dependent on the availability of labor instead of market demand.

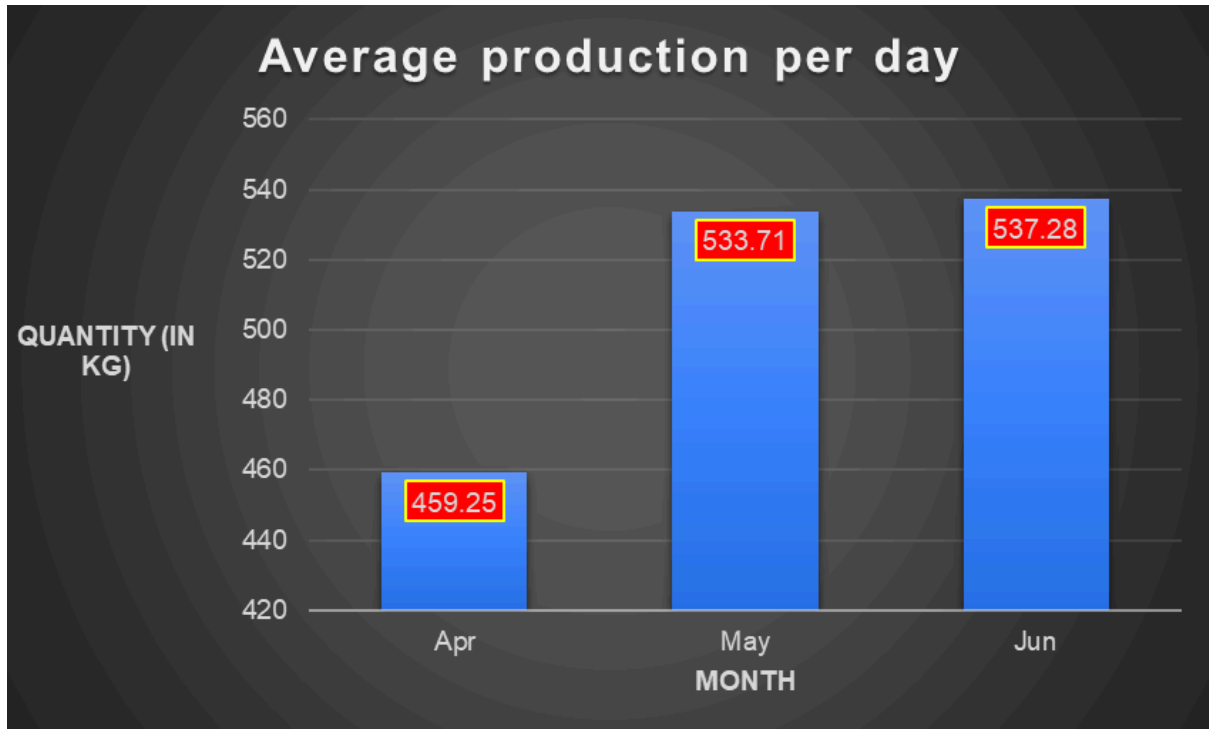


Figure 3: Chart showing average production on a working day in 3 months

Month	Production	Manufacturing Days	Average production per day	Expected Quantity
Apr	1837	4	459.25	6888.75
May	3736	7	533.71	8005.71
Jun	3761	7	537.29	8059.29

Figure 4: Table showing actual production ,expected production which can be achieved by working daily.

To address this issue, the company could consider hiring new skilled labor on a contract basis. This would ensure a constant workforce throughout the month, leading to an increase in production that is in line with market demand. Additionally, if the company introduces a new product to the market, having skilled labor readily available would enable them to easily meet the new demand for production. Skilled laborers may also provide new ideas and variety, ultimately increasing production efficiency.

Further analysis shows that keeping the labor charge constant while increasing total production in a month results in a reduction in the average cost of production. This would benefit the company in that they would only have to pay laborers at the end of the month, freeing up capital to address other issues during the month. By introducing skilled labor on a contract basis, the company can overcome production inefficiencies caused by a shortage of trained workforce and a dependence on labor availability, ultimately increasing production efficiency in line with market demand.

The Challenge of Raw Material Price Fluctuation for FMCG Companies:

In the highly competitive Fast Moving Consumer Goods (FMCG) industry, maintaining low cost and maximizing revenue is crucial for success. However, the fluctuation in the prices of raw materials can disturb the pricing scheme of any company. This is particularly true for Namkeen manufacturers who import raw materials from various countries, leading to daily fluctuations in the cost of raw materials.

A descriptive statistical analysis revealed that there is a high variance in the price of raw materials. The graph presented indicated a high margin of error due to this high variance. This makes it challenging for companies to maintain a low cost and plan their pricing strategy effectively.

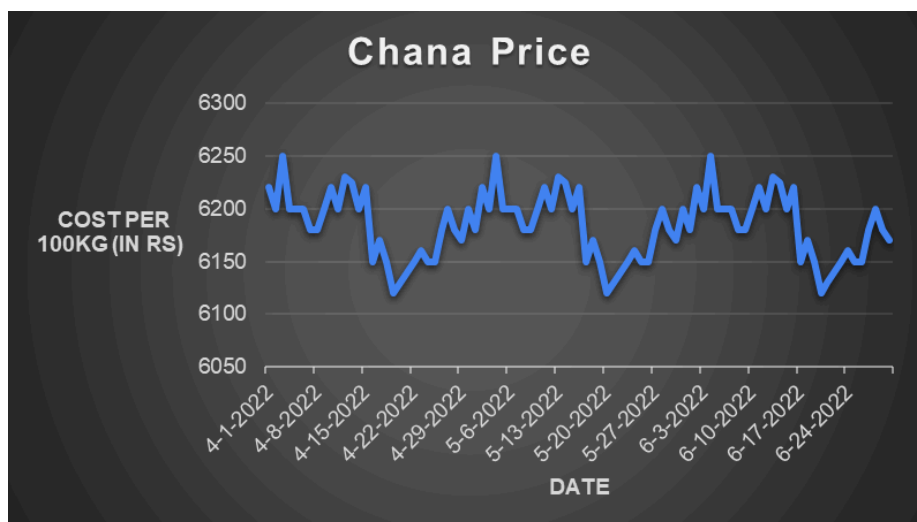


Figure 5: Line graph representing pattern of fluctuation of Chana Dal Price

To tackle this challenge, a line curve was drawn for each raw material separately. This revealed a pattern in the price of Chana Dal, indicating that purchasing it during the second half of the month could result in a lower cost compared to the beginning of the month. Similar curves were observed for other raw materials, with each having a different time of the month suitable for purchasing. However, a pattern could not be found for the price of refined oil.

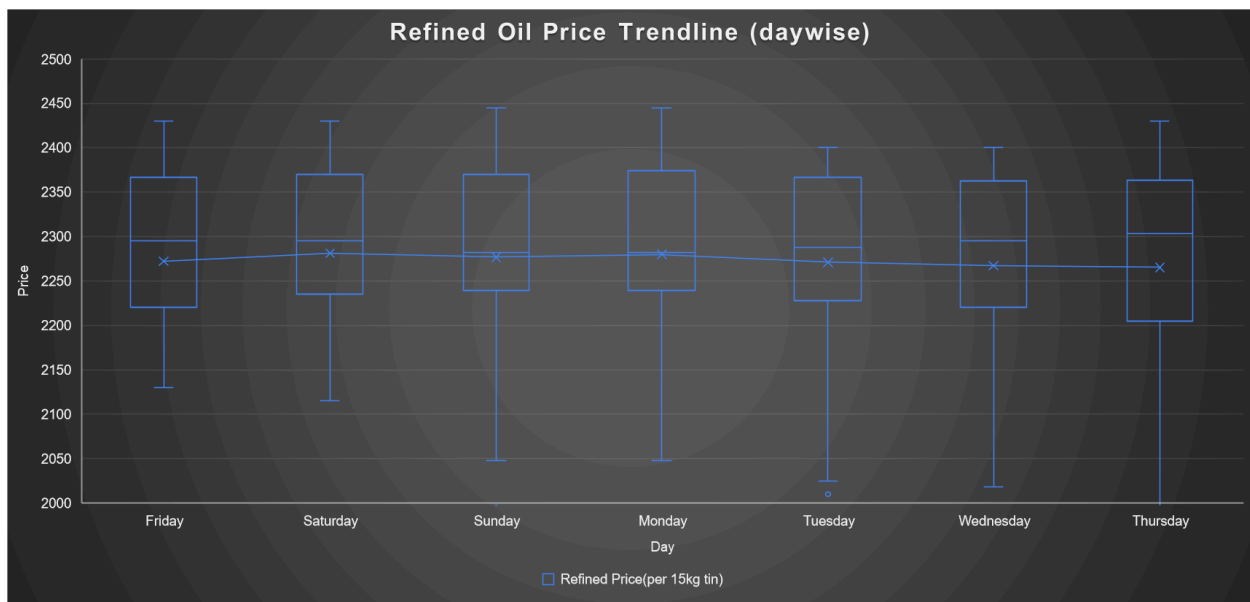


Figure 6: Box plot showing fluctuation of Refined Oil price daywise

To further analyze the trend in the price of refined oil, the data was manipulated by drawing a curve to see the day-wise trend throughout the week. This helped in identifying a pattern by zooming in on the price axis, which was not visible in the original graph.

In conclusion, the fluctuation in the prices of raw materials is a significant challenge for FMCG companies, particularly those like Namkeen manufacturers who import raw materials from various countries. To maintain a low cost and maximize revenue, it is crucial for these companies to analyze the data and identify patterns in the price fluctuations of each raw material. This can help them plan their purchasing strategy and pricing scheme effectively.'

Results and Findings

Diversifying Product Line to Increase Revenue and Reduce Dependency on a Single SKU

The analysis of the size distribution of the company's products revealed that a significant portion of the revenue is generated from one particular SKU, i.e., the pocket size packs. However, this SKU is not a viable option for long-term profitability as it requires extensive labor, and the profit margins are lower compared to other SKUs. To sustain the company's growth, it is essential to diversify the product line and focus on increasing sales of other SKUs.

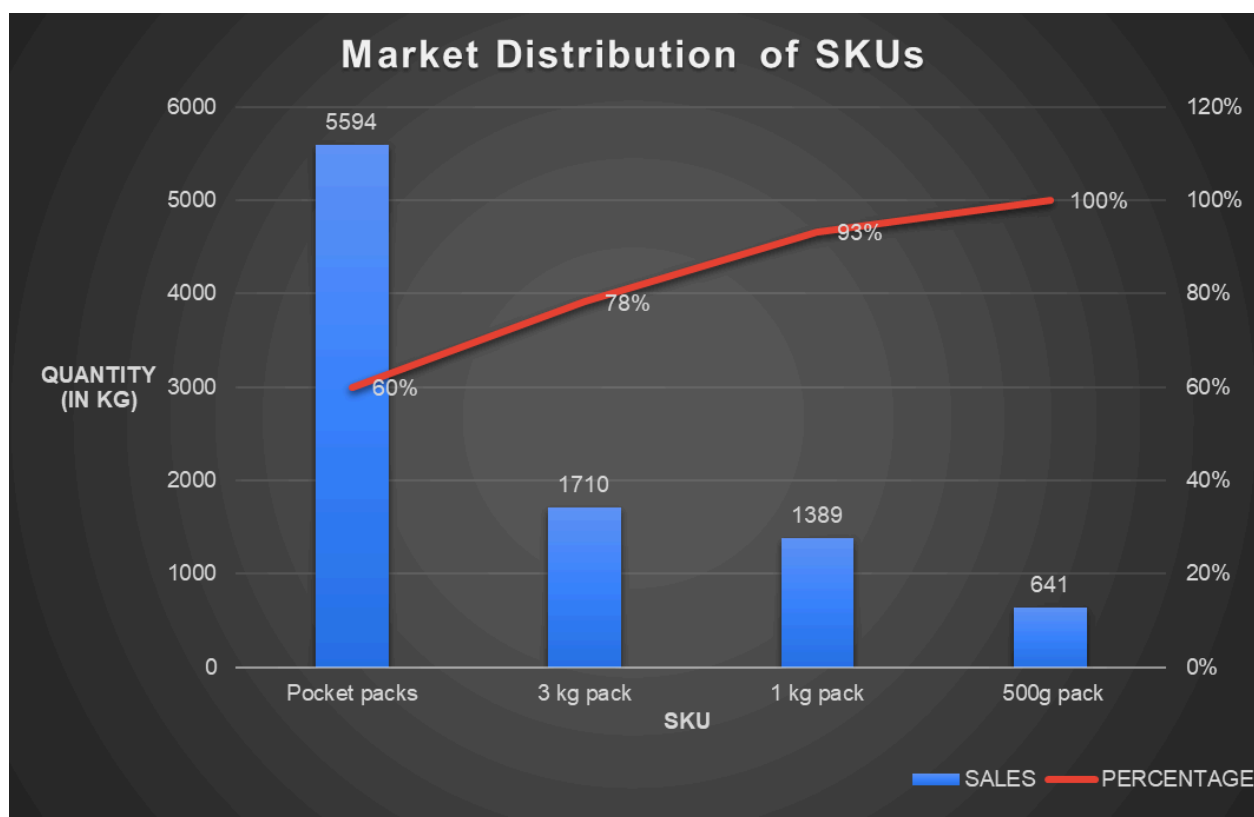


Figure 7: A combination of total sales done by SKUs and their share in revenue generated

To capture the market and increase revenue, the company can invest in increasing labor for packaging. However, the manual process is time-consuming, and automating the packaging process by adding new machines is a capital-intensive option. Hence, a suitable approach could be to introduce a new SKU of around 250g to fill the gap between the pocket size packs and 500g packs.

The regulation of price is done by regulating weights for the pocket size packs. Thus, it is necessary to reduce the company's dependency on this SKU to sustain long-term profitability. On the other hand, the 1kg and 3kg packs have a slightly higher profit margin, and the company can continue the same strategy for them while focusing on boosting the sales of 250g and 500g packs.

SKU	SALES	SALES PERCENTAGE	PROFIT MARGIN
Pocket packs	5594	59.93%	8.75%
3 kg pack	1710	18.32%	11.11%
1 kg pack	1389	14.88%	11.11%
500g pack	641	6.87%	9.38%

Figure 8: Table consisting total sales and profit margins of different SKUs

By diversifying the product line, the company can cater to the needs of a broader customer base and reduce the risks associated with a single SKU. It will also allow the company to increase revenue and improve profitability in the long run.

Analysis reveals untapped potential for production growth in the company

The manufacturing unit of the company is operating at a low capacity of only 25% with the factory working for 7-8 days per month. This low production level may be attributed to the company's hiring practices, as the owner has mentioned that they sometimes have orders that cannot be fulfilled due to the unavailability of labor. To overcome this issue, the company could consider changing its labor hiring method to find individuals who can handle both manufacturing and packaging tasks, rather than hiring

different labor for each job. This would allow for more efficient use of the available workforce and reduce the likelihood of unfilled orders.

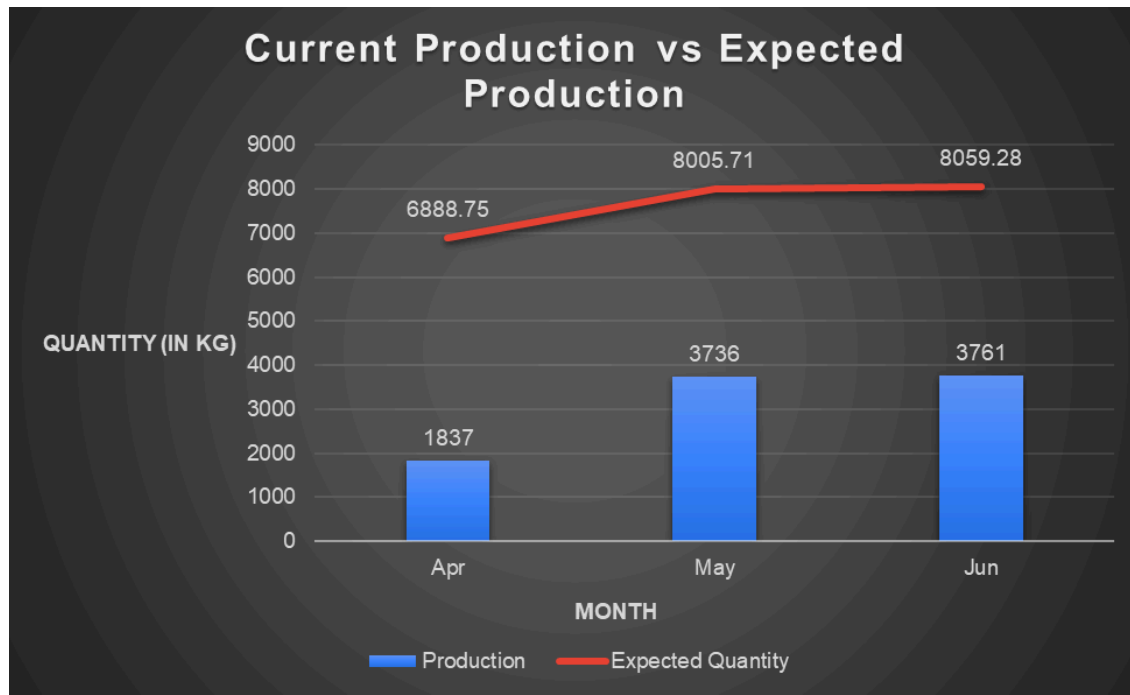


Figure 9: Graph showing expected production to be achieved by working daily

Further analysis of the data indicates that the company is producing only 4-7 days a month, with an average production per day in the range of 450 kg to 550 kg. The unavailability of labor is the reason behind the low number of days of production. However, if the availability of labor can be maintained, the total production in a month can be increased up to 8000 kg while considering the same range of daily production. This is an almost 220% growth compared to the current capacity.

Once the company is capable of producing such a large quantity, the labor charges can be kept constant, and there will be a surge in the unit production cost per kg. This will enable the company to add new SKUs to fill the gap in the market. Moreover, contract labor can provide a constant workforce throughout the month, with skilled labor who can do other works of packaging in the meantime. A reduction in production cost will give the company a chance to invest more in marketing.

Analysis shows potential cost savings for a food company through strategic raw material purchases

A food company can benefit significantly from strategic raw material purchases. The analysis shows that the cost of masoor dal is lower in the second half of each month, and the cost of maida goes a bit lower in a period of 15 days. While the cost of refined oil does not follow any pattern on a broader basis. However, after applying required transformations, a pattern emerged throughout the week. The company needs to capture the slightly low price of refined oil on a particular day every week.

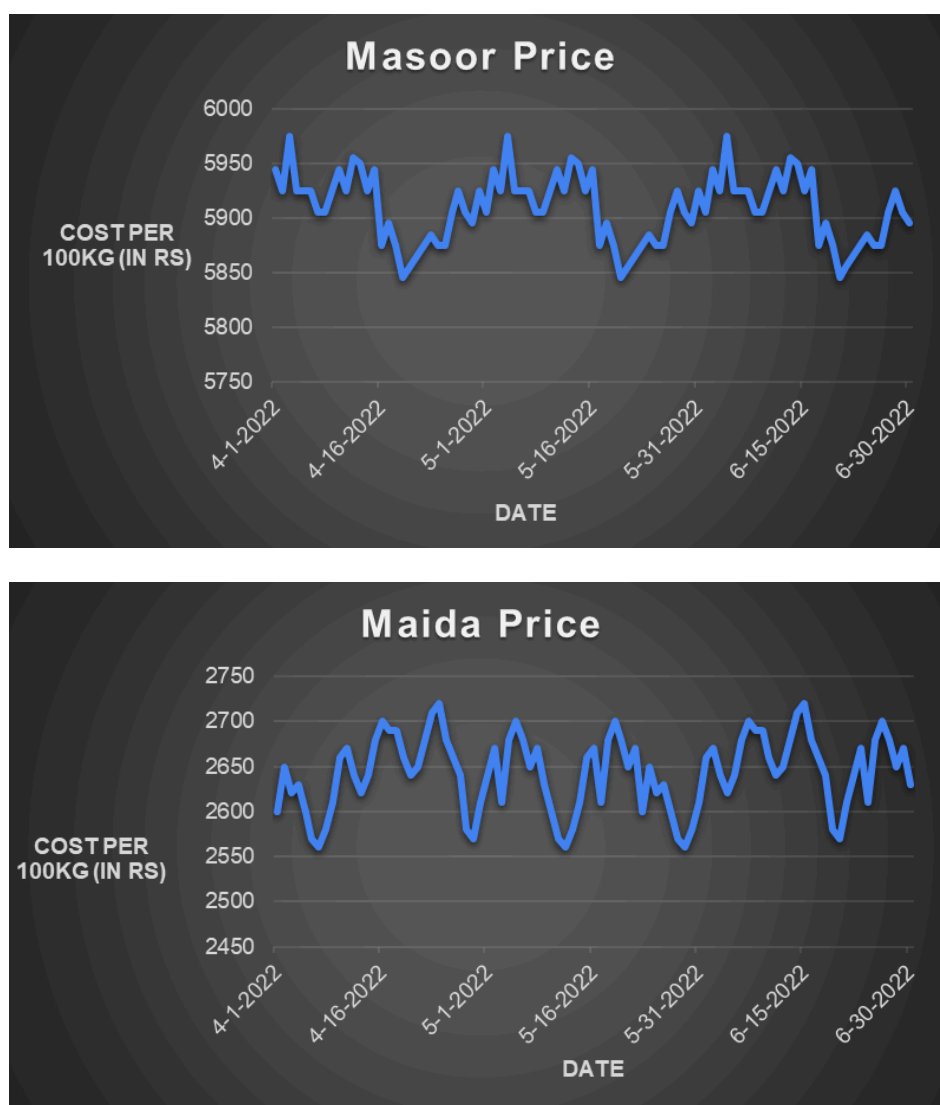


Figure 10: Line graph representing pattern of fluctuation of MasoorDal Price and Maida Price

Based on the information provided, it seems that the cost of refined oil is highly volatile and fluctuates significantly compared to other raw materials. However, since refined oil is an essential component and a primary input in the production process, the company cannot compromise its quality due to cost fluctuations, as it would have a direct impact on the quality of the final product.

From the data table, it is evident that the cost of refined oil fluctuates around Rs. 250, with an average cost of Rs. 2295. This means that the fluctuation in price is almost 12% (i.e., $\text{Rs. } 250 / \text{Rs. } 2295 * 100$).

	Refined(Rs/Tin)	Chana(Rs/Qntl)	Maida(Rs/Qntl)	Munfali(Rs/Qntl)	Masoor(Rs/Qntl)
Opening Cost	₹ 2,220.00	₹ 6,220.00	₹ 2,600.00	₹ 6,670.00	₹ 5,945.00
Highest Cost	₹ 2,445.00	₹ 6,250.00	₹ 2,720.00	₹ 6,790.00	₹ 5,975.00
Lowest Cost	₹ 1,958.00	₹ 6,120.00	₹ 2,560.00	₹ 6,540.00	₹ 5,845.00
Closing Cost	₹ 2,025.00	₹ 6,170.00	₹ 2,630.00	₹ 6,700.00	₹ 5,895.00

Figure 11: Table showing costs at different parameters for all the raw materials

Furthermore, based on the profit margin table, the average profit margin is around 9%. Therefore, the company needs to ensure that the cost of refined oil remains within an acceptable range to maintain its profitability. It may also consider implementing strategies to minimize the impact of cost fluctuations, such as hedging, bulk purchasing, or negotiating better deals with suppliers.

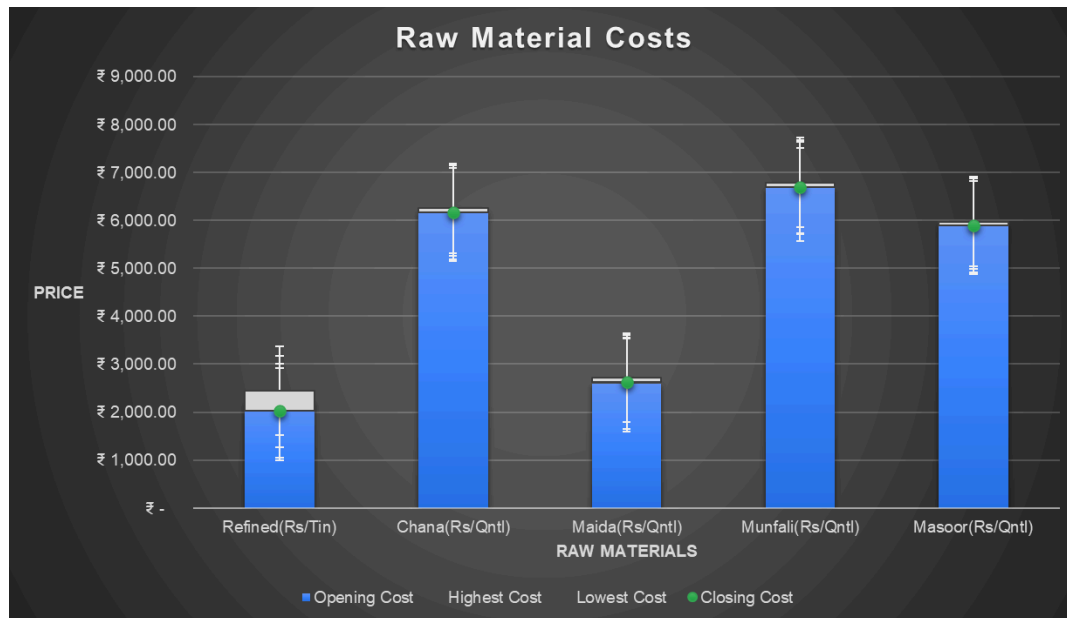


Figure 12: Graph representing spread of price of all the raw materials

The current purchasing pattern of raw material from a small wholesaler based on market demand is random, and the company needs to procure raw materials on a regular basis for uninterrupted production. To achieve this, the company could approach big vendors for bulk raw material purchases, stocking for a week or a month based on requirements.

The line graph shows that the cost of raw materials does not follow the same time of the month for a low cost, meaning that the company needs to time the purchase of each raw material based on its pattern. By using the weekly pattern for refined oil, the company can purchase stock for a week at once. This strategy could help the company save money and stabilize the cost of raw materials, leading to increased sales and revenue.

Interpretation of Results and Recommendation

SKU Management

Interpretation:

The company's revenue is heavily dependent on one particular SKU, which is not profitable in the long run due to its extensive labor requirement and low profit margins. To sustain the company's growth and profitability, it is essential to diversify the product line and increase sales of other SKUs.

Recommendations:

- Introduce a new SKU of around 250g to fill the gap between the pocket size packs and 500g packs. This will provide customers with more options and help reduce the company's dependency on the pocket size packs.
- Invest in increasing labor for packaging to meet the demand for the new SKU. However, automating the packaging process may be a capital-intensive option, so the company should carefully evaluate the cost-benefit of this approach.
- Regulate the prices by regulating the weights of the pocket size packs. This will ensure that the company maintains its profit margins while reducing its dependency on this SKU.
- Continue the same strategy for the 1kg and 3kg packs as they have a slightly higher profit margin. This will ensure that the company maintains profitability while diversifying its product line.
- Focus on boosting the sales of the 250g and 500g packs to reduce the company's dependency on the pocket size packs and improve its profitability in the long run.

- Diversify the product line to cater to the needs of a broader customer base and reduce the risks associated with a single SKU. This will allow the company to increase revenue and improve profitability in the long run

Workforce Management

Interpretation:

The manufacturing unit of the company is currently operating at a very low capacity, which is resulting in missed orders and lost revenue. The root cause of this issue is the company's hiring practices, which are not allowing them to have the required labor to increase their production. However, by changing their labor hiring methods and finding individuals who can handle both manufacturing and packaging tasks, the company can make more efficient use of their available workforce and reduce the likelihood of unfilled orders.

Further analysis of the data suggests that if the company can maintain the availability of labor, they can significantly increase their production capacity, which will result in a considerable growth of almost 220%. This will enable the company to add new SKUs and fill the gap in the market. Moreover, by using contract labor to provide a constant workforce throughout the month, the company can reduce the likelihood of missing orders due to a lack of labor.

Recommendations:

- Change Labor Hiring Practices: The company should consider changing their labor hiring practices and hire individuals who can handle both manufacturing and packaging tasks. This will allow for more efficient use of the available workforce and reduce the likelihood of unfilled orders.

- Increase Production Capacity: The company should work to increase their production capacity by maintaining the availability of labor. This will result in a significant growth of almost 220%, which will enable the company to add new SKUs and fill the gap in the market.
- Use Contract Labor: The company should consider using contract labor to provide a constant workforce throughout the month, with skilled labor who can do other works of packaging in the meantime.
- Invest in Marketing: With a reduction in production cost, the company should consider investing more in marketing to promote their products and expand their reach in the market.

Raw Material Management

Interpretation:

The interpretation of the given information is that a food company can benefit significantly from strategic raw material purchases by analyzing the price trends of different raw materials. The cost of refined oil is highly volatile and fluctuates significantly, making it challenging for the company to maintain its profitability. The company needs to implement strategies such as hedging, bulk purchasing, or negotiating better deals with suppliers to minimize the impact of cost fluctuations.

The company should also procure raw materials on a regular basis for uninterrupted production, and it could approach big vendors for bulk raw material purchases and stock for a week or a month based on requirements. By timing the purchase of each raw material based on its pattern, the company could save money and stabilize the cost of raw materials, leading to increased sales and revenue.

Overall, a strategic approach to raw material purchases could help the company improve its profitability and competitiveness in the market.

Recommendations:

- Analyze the price trends of different raw materials and identify the patterns in their cost fluctuations.
- Prioritize the purchase of raw materials with predictable cost patterns, such as masoor dal and maida.
- Implement strategies to minimize the impact of cost fluctuations in essential raw materials, such as hedging, bulk purchasing, or negotiating better deals with suppliers.
- Approach big vendors for bulk raw material purchases and stock for a week or a month based on requirements to procure raw materials on a regular basis for uninterrupted production.
- Time the purchase of each raw material based on its pattern to save money and stabilize the cost of raw materials.
- Monitor the cost of refined oil and ensure it remains within an acceptable range to maintain profitability.
- Implement quality control measures to ensure the final product's quality is not compromised due to cost fluctuations.
- Regularly review and update the company's raw material procurement strategy to adapt to changing market conditions and maximize profitability.