Application of Linear Programming to Profit Maximization

(A case study of Big Bazar)

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Abstract

The study considered is of supply chain management, for Big Bazar in Tarnaka (only single branch). The monthly held resources (fruits), quantity, and profit per unit for each product have been collected from the company. The gathered data has been used to estimate the parameters of the LPP. The model was solved using TORA software. The findings of the study show that the profit of the company can be improved by 10%, that is, the total profit of Big Bazar ₹15,454 per month (for a selected range of fruits) can be increased to ₹17,000(for a selected range of fruits) per month for by applying linear programming models.

Keywords: Linear programming problem, Fruits, Big Bazar, TORA, Maximizing Profits.

Introduction

Retailing companies all around the world including Big Bazaar, have faced issues during optimizing of production input. Customers are the most important factor for Big Bazar. The customers will be dependent on the retail stores for their primary needs. So, by carefully studying and researching about the product mix and feedbacks (like surveys and questionnaires) from customers, the Big Bazar makes necessary adjustments since the demand of customers will change over time. Then it is necessary to maintain the brand image in both the industry and target market. The focus would be maintained by this. The same-store sales of Big Bazaar were estimated to grow at a rate of nine percent in financial year 2021. This was a decrease from 13 percent in fiscal year 2018. Thus, this paper focuses on supply chain management of Fruits (only a selective range) based on efficient resource utilization for Big Bazar of Tarnaka (single branch) by seeing the sale of fruits in both morning and evening time. The issue addressed here was to determine the sale of fruits for obtaining the optimal profit with available resources which is a good supply chain management and necessary factors, using the linear programming technique through TORA. In line with this, the objective of the study was to suggest linear programming as a decision tool to determine the optimal product sale for maximizing profit with available resources.

Methodology

The following table summarizes the data. The first column is about a selective range of fruits taken into consideration, followed by the total stock brought in daily from the warehouse and various sources. The last column is price of fruits sold for every kilogram for stored fruits and fresh fruits.

Data Table 1:

| Fruits (Selective range)	Stock (Kg)	Price of fruits sold (per Kg)
Other Fruits	40	Stored fruits:15 Fresh fruits:10
Apples	60	Stored fruits:30 Fresh fruits:15
Mangoes	50	Stored fruits:20 Fresh fruits:10
Melons	30	Stored fruits:15 Fresh fruits:5
Citrus Fruits	50	Stored fruits:20 Fresh fruits:15

The following is the Data formulation from Data table 1.

As seen in the table below two variables X1 which is the actual amount of stored fruits (in kg) and X2 as actual amount of fresh fruits (in kg).We have formulated the following subject to constraints: 1,2,3,4, &5 using the Data table 1 from above, and compute the data as below by taking the price of stored fruits and fresh fruits sold per kg. The amount ₹200 and ₹170(this data is collected from the store manager) is the profit margin we get after sale of stored and fresh fruits. Since the profit is to be taken as monthly, we have multiplied the total stock of fruits from Data Table 1 with 30(assuming that there are 30 days in a month).

Stored fruits		X1		
Fresh fruits		X2		
Maximize	200.00	170.00		
Subject to				
S.No.	X1	X2		Total Stock (Monthly)
1)	15.00	10.00	<=	1200.00
2)	30.00	15.00	<=	1800.00
3)	20.00	10.00	<=	1500.00
4)	15.00	5.00	<=	900.00
5)	20.00	15.00	<=	1500.00
Lower Bound	0.00	0.00		
Upper Bound	Infinity	infinity		
Unrestr'd(yln)?	n	n		

We formulate the following equations:

1. $15x_1+10x_2<=1200$
2. $30x_1+15x_2<=1800$
3. $20x_1+10x_2<=1500$
4. $15x_1+5x_2<=900$
5. $20x_1+15x_2<=1500$

Now according to the data, we plot the coordinates on the graph to get the desired coordinates to get our profit Maximised.
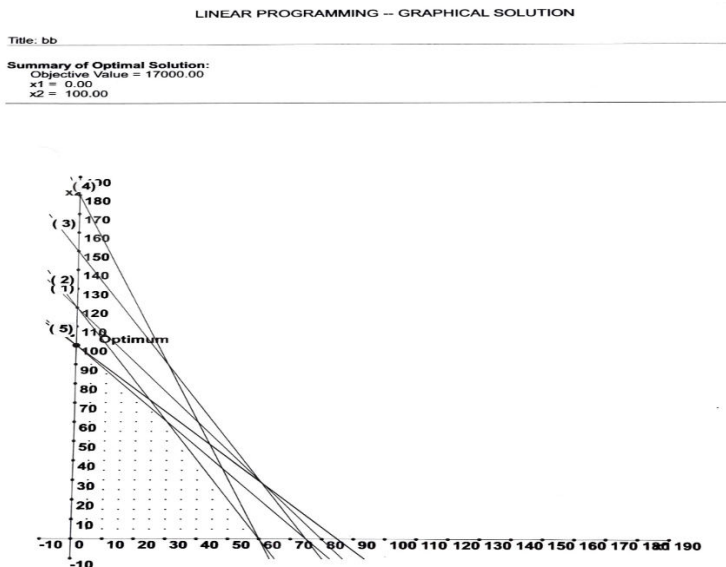
From the above graph we get two results as follows:

1. The total stored fruits should be 0.
2. The total fresh fruits should be 100.

Thus, as given up the optimum solution is ₹17,000.

Now we use the algebraic representation for LPP that is the simplex method to obtain our desired solution.

Conclusion

The research paper has led to some suggestions such as the following:

1. Ability to use resources (resource utilization in comparison with the stock) was recorded as one of the major constraints in the profit maximization for sale of selected range of Fruits.
2. The total stocked fruits are suggested to be 0, this is because stocked fruits gets stale and sale of such product affects the brand image, thus suggested value is 0. This can be done by proper check of fruits and routine verification of fruits.
3. After studying and researching about data, it was found out that the sale of Big Bazar was falling. Thus, profit plays a major role, by comparing the data of profits between the actual profit and the production using LPP models show sizeable differences of 10%.
4. Considering this point, it can be concluded that the apparel company should use quantitative research methods of linear programming to determine their optimal profit.

Thus, by concluding the research paper it was found out that if the sales were to be increased by removing the stocked fruits, then there will be a substantial rise in profits by 10% from ₹15,454 per month to ₹17,000 per month.

Proper marketing techniques and using the supply chain more efficiently to sale the fruits to the customers by adopting the LPP solution will improve the profit thus resulting in improvement of sale for fruits too. Using this operational research technique benefits the sale condition of Big Bazar.

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