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Maximizing Dimsum Production Profits Using Linear Programs with The Simplex Method

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ABSTRACT

The culinary industry, especially dimsum products in Indonesia, is experiencing rapid growth, which is accompanied by increasing public demand for delicious and practical ready-to-eat food. This study aims to optimize dimsum production profits in a successful dimsum shop in Bogor, West Java, by using linear programs and simplex methods. By analyzing data obtained from interviews and observations, it can be known the factors that affect decision-making, the goals to be achieved, and the limitations faced in production activities. This study provides guidance for Toko Dimsum Sukses to make the most of resources and increase profitability, although there are some limitations, such as linearity assumptions and external variables that are not considered. This study reveals that to achieve a maximum daily profit (Zmax) of Rp.19,800,000, a successful dimsum shop needs to produce original dimsum (X1) 120 times and dimsum mentai (X2) 1120 times.

Keywords: optimization, profitability, culinary industry.

1. INTRODUCTION

The culinary industry is one of the fastest-growing economic sectors due to the increasing demand for convenient and delicious ready-to-eat food. Products with good market prospects are dim sum. Dimsum is now a popular representation of Asian cuisine in many circles, and it is a promising business opportunity, especially for small and medium-sized businesses. However, the dimsum manufacturing process faces various challenges, especially limitations on resources such as raw materials, duration, and labor. These aspects can affect the effectiveness and profitability of the company. In preparing protein-rich foods, there are various cooking techniques that can be used, including frying, steaming, boiling, baking, and burning[1].

Optimization is an effort to increase effectiveness both at the team and individual levels related to the public interest, in order to obtain satisfaction and success in the implementation of these activities[2]. On the other hand, it is explained that optimization is a benchmark that can lead to the achievement of goals[3]. From a business perspective, optimization means an effort to maximize activities so that the desired profits can be realized. That profitability is the ability of a company to obtain profits based on a certain amount of sales, assets, and equity[4]. Profitability reflects the ability of a business entity to generate profits by utilizing all available capital. Dimsum has many fans in Indonesia and is a favorite choice by the public[5]. Some of the factors that support the popularity of dimsum in Indonesia include its delicious taste and as a better food alternative for health. With a simple serving method and a relatively high calorie count, which is 138 kcal per 100 g, dimsum is in great demand by people who live a fast-paced lifestyle. The uniqueness of dimsum makes it a distinctive attraction of Chinese cuisine that competes in the Indonesian culinary world. This high

demand encourages other entrepreneurs to explore similar business opportunities. As a result, economic actors compete with each other to create innovations and superior products that can meet consumer needs [3], [6], [7].

Dimsum is a delicious culinary that originated in China and is very popular in Indonesia. This dish is commonly served as a snack and is widely known in the community[8], [9]. Dimsum is a snack made from meat wrapped in dumpling skin, making it a favorite snack for many people. The popularity of dimsum has existed for thousands of years, with eating habits that have existed since the 14th century. At that time, farmers, laborers, and traders traveling on the Silk Road often stopped by roadside tea shops to enjoy their afternoon tea. One of the case studies in this study is a successful dimsum shop in Pajajaran, East Bogor District, Bogor City, West Java. The store provides original dimsum and dimsum products and makes a profit between Rp 19,800,000 to Rp 20,000,000 per month, with an average production of around 120 dimsum per day[5], [10], [11].

In this study, a similar approach is carried out using linear programming methods, especially the simplex method. The simplex method is a technique that is widely used in linear programming to find optimal solutions to various problems. This technique is suitable for use when there are two or more variables to find the best solution. The process of completing a linear program using the simplex method involves a series of iterations starting from a reasonable ground state to reaching the final ground state that provides optimal value for the objective function. This research aims to use the linear program method and the simplex method to optimize the dimsum shop produced in maximizing profits in the successful dimsum shop.

1.1 Linear Schedule

Linear programming is a mathematical method to maximize or minimize objective functions that are limited by a series of constraints. In the context of production, linear programming helps in determining the optimal combination of various decision variables, such as the number of products that must be produced to maximize profits. Linear programming is particularly useful for decision-making in a variety of areas, including production and operations management[12]–[14].

1.2 Simplex Method

The simplex method is an algorithm used to solve linear programming problems. This method focuses on the node points of the feasible area to find the optimal solution. The simplex method is one of the most commonly used techniques in optimization because it can efficiently handle problems with many variables and constraints [15]-[17].

1.3 Profit Optimization in Production

Profit optimization in production involves analyzing costs and revenues to achieve the highest level of profit. The application of optimization techniques in dim sum production can significantly increase profitability, demonstrating the importance of proper analysis for production decision-making [18].

1.4 Digital marketing

Digital marketing includes all marketing actions that use electronic technology or internet networks. It involves a number of channels, including social platforms, email, web search, and site pages. Digital marketing allows businesses to reach more consumers with lower expenditure compared to conventional marketing techniques. In the food sector, the digital marketing function is crucial to attract new customers and retain existing customers.

1.5 Previous Research

Several previous studies have shown the importance of applying linear programs and simplex methods to other journals:

1. Production Optimization in IKM Z and J Cookies

   This study describes the application of linear program methods and simplex models. Programming of a simplex model to determine the optimal combination of bread production. With the application of the simplex method, bread production increased by 55 loaves per day, from 3,500 to 3,555 loaves, compared to the company's own method. Profit also increased from IDR 4,991,930 to IDR 5,101,930 per day. These results show that the simplex method is more effective in maximizing company profits

compared to traditional methods. This study supports previous research such as [13] also found that the simplex method can maximize the profits of small and medium-sized businesses with limited resources [19].

2. Case Study of Bu Mar Food Stall
   In this study, a linear program with a simplex model was used to determine the optimal amount of production for the duck rice and chicken rice menus. With limited resources, producing 80 servings of duck rice (Rp 12,000 per serving) and 20 servings of chicken rice (Rp 6,500 per serving) can generate a maximum profit of Rp 1,090,000 per day. These results confirm that the linear program approach is able to optimize production decisions even in resource-limited situations.
3. Production Optimization Using the Simplex Method
   Research [19] shows that the Simplex method is effectively used in decision-making processes in various industrial sectors. This study concludes that the Simplex method helps in maximizing profits by determining the optimal production mix based on the limited resources available.
4. Applications of Linear Programming in Various Industries
   Research [20] examines the application of linear programming in optimizing various production problems. This method can provide an optimal solution for the mix of production, logistics, and resource allocation, thereby increasing operational efficiency.

2. METHODS

This research begins with the formulation of the problem and ends with a conclusion. This research aims to ensure that the results obtained are in accordance with the set goals. The location of the research is Toko Dimsum Sukses which is located in Pajajaran, East Bogor District, Bogor City, West Java. The products that are the focus of this study are two variants of dimsum, namely the original dimsum and dimsum mentai. The stages in this study consist of:

1) Problem Identification
   Problem identification is the initial process of finding a research problem by gathering information from various relevant sources and describing the situation clearly. In our research, the problem faced by successful dimsum factories is how to maximize the profits of successful dimsum shops per pcs of products.
2) Data Collection
   Data collection is the steps of identifying data sources, selecting tools or techniques, and implementing them according to the research design. The data collection method in our study was carried out through observation of employees who were carrying out their duties in order to collect the information needed. The factory manager at the dimsum shop was successfully interviewed and provided the necessary information. The data obtained includes various things, including raw materials for the production process, additional ingredients, production volume, number of staff, and daily income from dimsum making. Furthermore, the main goal of this study is to find the most efficient daily production quantity setting for two different types of dimsum, in order to maximize the profits of the Successful Dimsum Shop. To achieve this goal, this study uses a linear programming method with a simplex approach.
3) Analyze the results
   Results analysis is the process of drawing conclusions based on data that has been tested and analyzed to find solutions to the problems raised. The results of data processing are analyzed again to determine the number of product combinations that generate the highest profits.
4) Conclusions and advice
   The results of the research are analyzed, and the hypothesis is compiled into a conclusion. Successful dim sum companies seek advice on dim sum production volumes to make the most of available resources.

3. RESULTS AND DISCUSSIONS

The results of the interview have revealed that the dimsum shop has succeeded in producing 2 variants, namely the original dimsum and dimsum mentai. The dimsum shop has 2 production lines that each carry out 60 productions, and produces 8 boxes of dimsum from each variant at each production. Thus, the dimsum shop's production capacity can reach 120 times every day, which is equivalent to 9,600 boxes in a day. Therefore, the dimsum shop has recorded a profit between 19,800,000 to 20,000,000.

Tabel 1 Data Ketersediaan dan kebutuhan bahan baku			
Raw material	**Original dimsum**	**Dimsum Mints**	**Supply**
Chicken meat	10	10	2400 kg
Shrimp	3	4	840 kg
Eggs	20	25	5400 items
Dumpling skin	2	2	480 kg
Tapioca flour	1	1	360 kg
Carrots	2	1'5	240 kg
Garlic	0'5	0'5	120 kg
Sesame oil	0'2	0'2	60 L
Flavoring enhancer	0'1	0'1	24 kg
Chili sauce	1	1	120 L
Mayonnaise		2	240 L
Gas	0'5	0'5	120 Kg
Torch		23	1400
Production capacity per day	1	1	120
Profit	150.000	180.000	
Source : Dimsum Factory Success (2025)			

3.1 Manual calculation

In this study, a solution can be found by applying a linear program that contains decision variables, goal functions, and constraint functions. Here are the steps to resolve the issue:

a. Defining variable functions
   X_1 = Dimsum Original
   X_2 = Dimsum Mentai
b. Define the function of the goal
   $Z = 150.000_1 + 180.000_2$
   $Z = 150.000_1 + 180.000_2 = 0$
c. Define the function of a constraint or constraint
   1) Chicken meat : $10X_1 + 10X_2 \leq 2400$
   2) Shrimp : $3X_1 + 5X_2 \leq 840$
   3) Eggs : $20X_1 + 2X_2 \leq 5400$
   4) Dumpling skin : $2X + 6X \leq 480$
   5) Tapioca flour : $X_1 + X_2 \leq 360$
   6) Carrots : $2X_1 + 1{,}5X_2 \leq 240$
   7) Garlic : $0{,}5X_1 + 250X_2 \leq 120$
   8) Sesame oil : $0{,}2X_1 + 0{,}2X_2 \leq 60$
   9) Flavoring enhancer : $0{,}1X_1 + 0{,}1X_2 \leq 24$
   10) Chili sauce : $1X_1 + 1X_2 \leq 120$
   11) Mayonnaise : $2X_2 \leq 240$
   12) Gas : $0{,}5X_1 + 0{,}5X_2 \leq 120$
   13) Torch : $23X_2 \leq 1400$
   14) Production capacity per day : $1X_1 + 1X_2 \leq 120$
d. Change the constraint or boundary function by adding a slack variable
   1) Chicken meat : $10X_1 + 10X_2 = 2400$
   2) Shrimp : $3X_1 + 4X_2 = 840$
   3) Eggs : $20X_1 + 20X_2 = 5400$
   4) Dumpling skin : $2X_1 + 2X_2 = 480$
   5) Tapioca flour : $1X_1 + 1X_2 = 360$
   6) Carrots : $2X_1 + 1{,}5X_2 = 240$
   7) Garlic : $0{,}5X_1 + 0{,}5X_2 = 120$
   8) Sesame oil : $0{,}2X_1 + 0{,}2X_2 = 60$
   9) Flavoring enhancer : $0{,}1X_1 + 0{,}1X_2 = 24$
   10) Chili sauce : $1X_1 + 1X_2 = 120$
   11) Mayonnaise : $2X_1 = 240$
   12) Gas : $0{,}5X_1 + 0{,}5X_2 = 120$
   13) Torch : $23X_1 = 1400$
   14) Production capacity per day : $1X_1 + 1X_2 = 120$

e. Converting the mathematical model equations to the original simplex table is an important step in this analysis. Table 2 below shows the results of applying slack variables to the original simplex table, which converts the constraint function and the goal function into a standard form for the simplex method

Table 2. Calculate using the simplex method

Raw Materials	Original dimsum (X1)	Dimsum Mints (X2)	Supplies
Chicken meat	10	10	2400
Shrimp	3	4	840
Eggs	20	25	5400
Dumpling skin	2	2	480
Tapioca flour	1	1	360
Carrots	2	1,5	240
Garlic	0,5	0,5	120
Esame oil	0,2	0,2	60
Flavor enhancer	0,1	0,1	24
Chili sauce	1	1	120
Mayonnaise		2	240
Gas	0,5	0,5	120
Torch		23	1400
Production capacity per day	1	1	120
Profit	150.000	180.000	

Source : Dimsum Factory Success (2025)

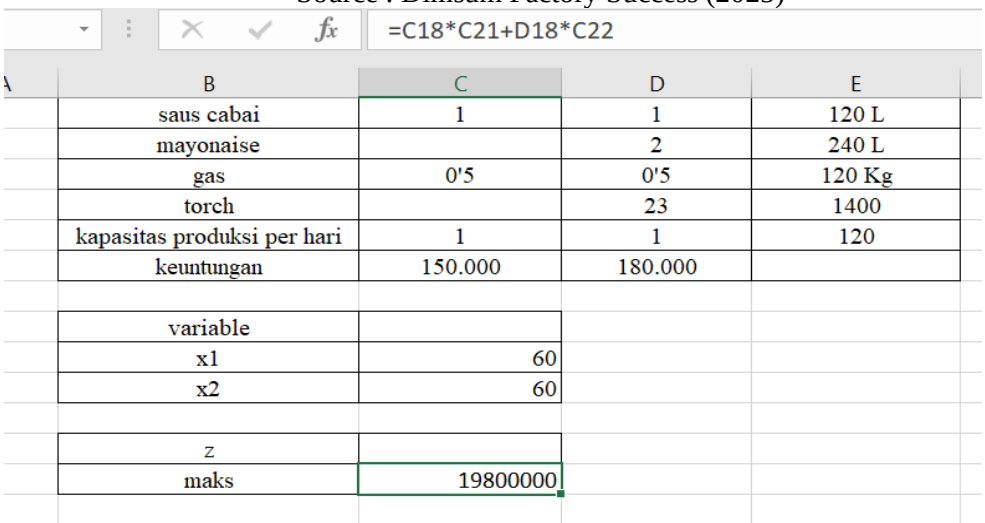
f. Maximum profit amount

Table 3. Determining Maximum Profits

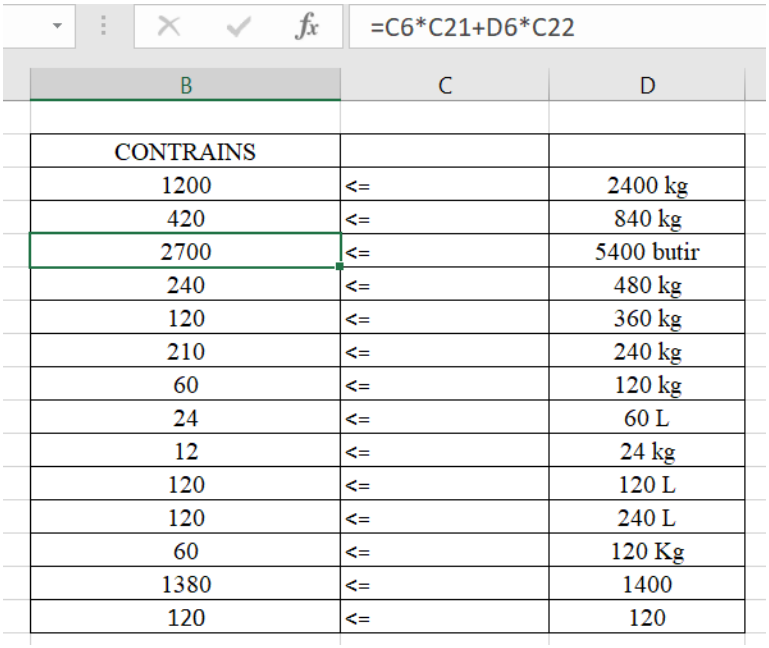
VARIABLE	
X1	60
X2	60

Z	
MAKS	19.800.000

Source : Dimsum Factory Success (2025)



From the profits obtained in the original dimsum (X1) and dimsum mentai (X2) multiplied by each variable X1 and X2 can produce a maximum profit of Rp. 19,800,000.



The results of the above calculation show that there are no negative values, which indicates that the optimal result has been achieved. The maximum profit (Zmax) achieved by a successful dimsum shop is Rp19,800,000 per day, and the production is 60 times that of the original dimsum (X1) and Mentai dimsum (X2).

3.2 Research Limitations

The research that is being carried out now still has many weaknesses and limitations, including:

1. Production Data: This study only used dimsum production data obtained from a specific period, so the results may not reflect long-term production variations.
2. Linearity Assumption: Linear program models assume linear relationships between variables, so they do not take into account non-linear factors such as changes in production costs or labor efficiency at a particular production scale.
3. Controlled Variables: This study only considers controllable variables, such as raw materials and production time, without including external variables such as fluctuations in raw material prices or changes in market demand.
4. Resource Limitations: Optimization results depend on the assumption of resource limitations specified in the study, such as the amount of raw materials and machine capacity, which may differ under real conditions.
5. Focus on the Simplex Method: This study only uses the simplex method to complete a linear program, so it does not compare with other optimization methods that may give different results.
6. Validation Limitations: The solution obtained has not been directly tested under real operational conditions, so its effectiveness in practice requires further testing.
7. Specific Production Scale: Optimization is done at a specific production scale and may not be relevant if applied to a larger or smaller production scale.

4. CONCLUSIONS

The conclusion that can be drawn is that this study successfully shows that by utilizing the linear and simplex program methods, dimsum shops can successfully optimize the production of two variants of dimsum original dimsum mentai dimsum products to maximize profits. The results of the analysis show that the store is able to produce up to 120 times per day with a profit between 19,800,000 to 20,000,000 per day. The main problem faced by Dimsum Sukses Shop is maximizing profit per unit of product. Through data collection and analysis, this research provides relevant solutions to improve production efficiency. This study has several limitations such as using production data from a certain time period, assuming linearity in the model, and not considering

external variables that can affect production results. The researcher suggested that companies and parties involved pay attention to the results of this study to overcome the problems that exist in the combination of dimsum production. It is hoped that with the implementation of these improvements, the company can obtain maximum profits from dim sum production in accordance with the analysis carried out. It is hoped that with the implementation of these suggestions, Toko Dimsum Sukses can improve its operational efficiency and profitability.

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