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**OPTIMIZATION OF EXPORT DEMAND FROM JAPAN FOR BREAD COMMODITIES  
USING THE SIMPLEX METHOD  
(CASE STUDY OF COMPANY XYZ IN THE UNITED STATES OF AMERICA)**

**Aldi Adi Pratama<sup>1</sup>**

<sup>1</sup>Industrial Engineering Study Program, University Al Azhar Indonesia,  
[aldiadipratama20839aldi@apps.ipb.ac.id](mailto:aldiadipratama20839aldi@apps.ipb.ac.id)

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**ABSTRACT**

The company's condition in facing the global economic crisis, which was caused by the prolonged regional military conflict between Russia and Ukraine, also affected the plan to optimize research on production and sales operations. This problem is also needed by XYZ Company in the United States based on the wheat processing industry in the United States, with the main processed product, namely bread, having problems in choosing decisions from various options, to optimize production for export demand from Japan. This study aims and is expected to know and be able to optimize the long-term profit costs of XYZ company. This research method uses the scientific branch of Industrial Engineering Operations Research, namely the simplex method. Observational analysis also emphasizes the principles of scientific literature review. As a result of collecting and processing the data, it was found that company XYZ earned profits from two types of bread, namely \$3 million for strawberry bread and \$5 million for chocolate bread. Company XYZ can obtain a maximum profit of 27.5, if it produces goods X1, namely 5/6 tons of strawberry bread and 5 tons of chocolate flavored X2.

Keywords : Bread, Export, Optimal, Simplex Method, Wheat.

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**1 INTRODUCTION**

The global corporate economic system tends to emphasize optimization of all matters related to meeting costs, both internally and externally. The optimization system within the scope of the company is a normative approach to identify the best solution in making a decision on a problem. In this optimization, the company will get the best results according to the given limitations [1]. The concept allows the relevant management in the production and shipping clusters to deliver contribution achievement of sustainable profit and can increase cash flow positively. The management chain flow that has been described is also expected to be able to make decisions from various existing options, so that the production line process reaches the consumer's hands efficiently and effectively. Efficiency is an activity in achieving the maximum possible performance, by using the principle of available possibilities such as sub-materials, machines, and humans in the shortest possible time in a factual situation without disturbing the balance between objective, tool, effort, and time factors [2]. While work effectiveness is basically the result of employee work based on organizational goals, then it is true or false or appropriate or not an organization's expectations are seen from the results of the work of employees [3]. The

plan that has been described, is known to have occurred in the XYZ company based on the wheat processing industry in the United States, with the main product of the land being the commodity of Bread. Analysis of the findings carried out by researchers for one month, found problems in the form of many possible decisions in optimizing costs, giving rise to doubts related parties in making long-term decisions. Given this company will fulfil export demand from Japan, which is the current main economic market destination. Therefore a good decision is a decision that has been selected from various alternatives that have been thoroughly analyzed, and if this is not done properly, then rejection will arise from the highest level of top management [4]. The session was also based on the company's strategy in dealing with the global economic crisis, which was caused by a prolonged regional military conflict between Russia and Ukraine. If the crisis does not carry out evaluation responses and alternatives, then the flow of company profit costs can be said to be not smooth, resulting in further cost burdens. Based on this background, the researcher determined the research title 'Optimizing Export Demand from Japan for Bread Commodities Using the Simplex Method with a Case Study of Company XYZ in the United States'. This research aims and it is expected that the company can do optimizing costs and increase company XYZ profits.

## 2 METHOD

This research method uses the approach of the scientific branch of Industrial Engineering, namely the simplex method. Observational analysis also emphasizes the principles of scientific literature review. The steps in this research can be explained as follows:

### a. Study Literature

Literature study is a research design used in collecting data sources related to a topic. Data collection for literature study was carried out using a database search tool which served as a literature search stage [5]. This stage includes a study of the simplex method with an emphasis on cost minimization. Literature source technique studied Derived from National and International Journal articles such as indexed by Sinta and Scopus. The process stages are expected to contribute to strengthening data processing, and drawing conclusions based on research earlier.

### b. Problem Formulation

Determination of the formulation of the problem is found based on the level of company needs, which consists of questions, and will be answered in the research discussion session. The formulation of the problem in question is how to optimize good profits, in the processed wheat bread industry.

### c. Data collection

The data collection process carried out by researchers in this activity was based on interview observations of stakeholders in the operations of the wheat processing industry. The interview process was carried out when the company was still carrying out a production project. Projects are activities carried out within a period of time and allocating limited resources, in order to obtain clear quality criteria standards [6]. Data collection is also applied to company archive files, such as sales, receipt of orders that contain prices and

quantities of requests. This collection technique places more emphasis on qualitative calculations of operations research methods simplex within the scope of industrial engineering.

d. Data processing

Data processing with the simplex method has optimization orientation, functions, goals and limitations. The Simplex method is part of the Linear Programming (LP) and can be used because this method can combine raw materials and the benefits obtained. LP problems using the simplex method are very helpful because they make it easier to make decisions and provide the best solutions for solving problems. This method can be used for optimization problems in industry, mixed production, scheduling, transportation problems until logistic [7]. This processing formula can be seen as follows:

$$1) \quad Z = \sum_{j=1}^n C_j X_j \dots\dots\dots(1)$$

2) Objective Function

$$Z = c_1 x_1 + c_2 x_2 + \dots + c_n x_n \dots\dots\dots(2)$$

$$a_{11} x_1 + a_{12} x_2 + \dots + a_{1n} x_n \leq b_1 \dots\dots\dots(3)$$

$$a_{21} x_1 + a_{22} x_2 + \dots + a_{2n} x_n \leq b_2 \dots\dots\dots(4)$$

$$a_{m1} x_1 + a_{m2} x_2 + \dots + a_{mn} x_n \leq b_m \dots\dots\dots(5)$$

$$x_1, x_2, \dots, x_n \geq 0 \dots\dots\dots(6)$$

Information :

$X_j$  = Number of activities  $j$ , where  $j = 1, 2, \dots, n$  which means there are  $n$  decision variables

$Z$  = Objective function value

$C_j$  = contribution per unit of activity  $j$ , for the maximization problem  $c_j$  denotes or revenue per unit, while in the case of minimization it denotes the cost per unit

$b_i$  = Number of resources  $i$  ( $i = 1, 2, \dots, m$ ), means that there are  $m$  types of resources

$X_{ij}$  = The amount of resource  $i$  consumed by resource  $j$ .

$c_1 x_1 + c_2 x_2 + \dots + c_n x_n$  : The objective function or criterion function to be maximized, expressed by  $Z$

$c_1, c_2, \dots, c_n$  : Cost coefficient (which is known)

$x_1, x_2, \dots, x_n$  : The decision variable or activity level to look for

$a_{ij}, i = 1, 2, \dots, m$  : delimiter to  $i$

$j = 1, 2, \dots, n$  : Technology coefficient

$b_i$  : The coefficient of the right-hand side

$x_1, x_2, \dots, x_n \geq$

e. Publication

The process of calculating the known simplex method is then published to companies through scientific posters, so that it is easily understood by the public. A scientific poster is a picture or illustration of an abstract of a scientific work or a collection of research that has been carried out [8]. This publication

process also emphasizes the in-depth conclusion orientation system, so that interested parties can understand in detail.

f. Conclusion Drawing

The process of drawing conclusions by researchers is based on the precautionary principle, so that conclusions can be accepted by everyone, including readers. This stage contains the calculation results of the simplex method, which are then verified by the top management of XYZ company.

The visualization of the research stages can be seen in Figure 1 below :

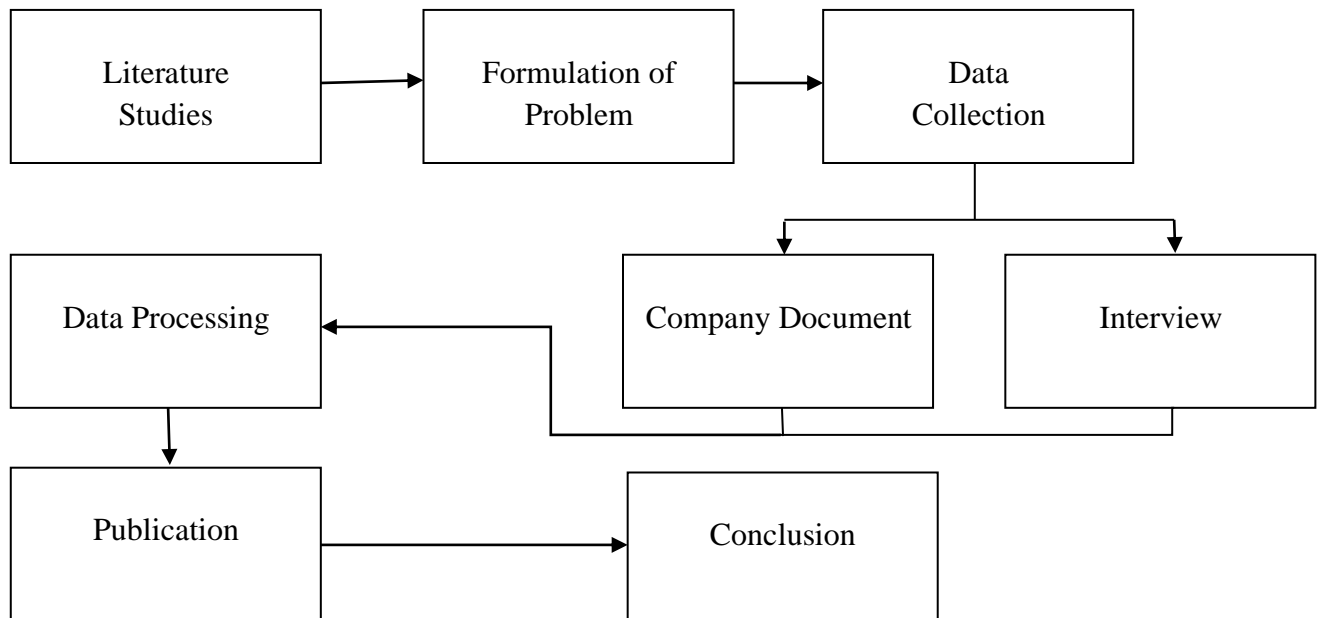


Figure 1 Research Method Flow

### 3 RESULTS AND DISCUSSION

a. Objective Function Determination

The process of collecting data with the company's internal and external documents, shows the distribution of details of the main production needs. Withdrawal and collection of price data using units of US dollars (\$). The constraints obtained are wheat raw material commodities, with the determination of the value (Z) as the goal obtained from the difference in calculating the company's income with the costs incurred. Production data in question, can be seen in Table 1 below:

Table 1 Raw Material Needs One Time Production

No	Description	Production Needs (Tonw)		Stock (Tonw)
		Strawberry Bread	Chocolate Bread	
1	Wheat Flour	2	-	8
2	Yeast and Flavoring	3	-	15
3	Chicken Egg's	6	5	30

Source: Data processed by the author (2023)

From Table 1, the researchers also found the findings of the production advantages of the two types of bread, which can be seen in Table 2 below:

Table 2 Production Profits

No	Description	Amount	
		Strawberry Bread	Chocolate Bread
1	Income (\$)	1	0,9
2	Production Cost (\$)	1,5	1,1
3	Profit (\$)	3	5

Source: Data processed by the author (2023)

Data collection from Table 2 shows the profits that company XYZ gets from two types of bread, namely 3 million dollars for strawberry bread and 5 million dollars for brown bread. The principle of loyalty in this company is very concerned, so that the profit rate is said to be very high and covers the world market [9]. This is in accordance with previous research, which is the basis for companies to develop companies by generating brand loyalty from consumers. After the company can generate brand loyalty from consumers, the company will automatically get positive signals and feedback from consumers [10]. Analysis of Table 1 can then be formulated as follows:

$$\text{Maximize } (Z) = 3 X_1 + 5 X_2$$

b. Pengolahan Data Linear Programming

1) Decision Variables

Bread Production Amount Strawberry as  $X_1$

Chocolate Bread Production Amount as  $X_2$

2) Objective Function

The objective function is taken from the maximizing data formulation, namely  $Z = 60 X_1 + 56 X_2$

3) Limiting Function

Wheat flour :  $2 X_1 \leq 8$

Yeast and Flavoring :  $3 X_1 \leq 15$

Egg :  $6 X_1 + 5 X_2 \leq 30$

Calculations and data processing then enter into the processing step of changing the limiting function into an equation.

$$Z - 3 X_1 - 5 X_2 = 0$$

$$2 X_1 + S_1 = 8$$

$$3 X_2 + S_2 = 15$$

$$6 X_1 + 5 X_2 + S_3 = 30$$

Table 3 Preparation of Equations

Variabel	X1	X2	S1	S2	S3	Mark
Z	-3	-5	0	0	0	0
S1	2	0	1	0	0	8
S2	0	3	0	1	0	15
S3	6	5	0	0	1	30

Source: Data processed by the author (2023)

The equation is then entered into the table, according to the position and function of each. The determination of the key column is based on changing Table 3 above, with the largest negative value. Then the key row is calculated by finding the index of each row as follows :

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$$Index = \frac{Column\ Value}{Key\ Value_i}$$

Calculation index Table 3 then, it was found that the findings were given an orange color by the researcher, which can be seen in Table 4 below :

Table 4 Simplex First Stage Calculations

Variabel	X1	X2	S1	S2	S3	Mark
Z	-3	-5	0	0	0	0
S1	2	0	1	0	0	8
S2	0	3	0	1	0	15
S3	6	5	0	0	1	30

Source: Data processed by the author (2023)

Results Calculation determine the position of rows and columns, then proceed with calculation literacy 1 that can seen in Table 5 below :

Table 5 Calculation of Literacy Data 1

Variabel	X1	X2	S1	S2	S3	Mark
Z	-3	0	0	5/3	0	25
S1	2	0	1	0	0	5
S2	0	1	0	1/3	0	5
S3	6	0	0	-5/3	1	5

Source: Data processed by the author (2023)

Based on Table 5, row Z still has a negative value component, and is reprocessed to achieve cost optimization, which can be seen in Table 6 below:

Table 6 Calculation of Literacy Data 2

Variabel	X1	X2	S1	S2	S3	Mark
Z	0	0	0	5/6	3/6	55/2
S1	0	0	1	5/9	-1/3	19/3
X2	0	1	0	1/3	0	5
X1	1	0	0	-5/18	1/6	5/6

Source: Data processed by the author (2023)

The results of the final calculation of the optimization are as follows:

$$X1 = 5/6$$

$$X2 = 5$$

$$Z = 55/2 = 27,5$$

#### 4 CONCLUSION

Based on the results of data collection and processing carried out by researchers, this activity can be concluded as follows:

- a. The profit that company XYZ gets from the two types of bread is 3 million dollars for strawberry bread and 5 million dollars for chocolate bread.
- b. Company XYZ can obtain a maximum profit of 27.5, if it produces X1 goods, namely 5/6 tons of strawberry bread and 5 tons of chocolate flavored X2 goods.

#### 5 ACKNOWLEDGMENTS

Researchers express their gratitude for the dedication of teaching staff at Al-Azhar Indonesia University lecturers, in providing Operations Research knowledge in providing evaluations and solutions, towards making decisions correctly.

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