Journal of Industrial Engineering and Halal Industries (JIEHIS)
P-ISSN 2722-8150, E-ISSN 2722-8142
Vol. 6 No. 1 June 2025, Pp 01-06
https://doi.org/10.14421/jiehis.5287

Submitted: 2025-03-10
Revised: 2025-04-28
Accepted: 2025-06-25
Online: 2025-06-30

Optimization of Hijab Production Profits for MSME Saveer Hijab Using the CPLEX Application

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Abstract

Micro, Small, and Medium Enterprises play a major role in economic growth in Indonesia and must continue to be supported and developed in order to compete at a global level. Saveer Hijab is one of the hijab fashion brands in the MSME sector that produces various types of hijab. Saveer Hijab experienced a decline in sales because the number of requests was not balanced with production costs due to the increase in raw material prices. This study aims to formulate an optimization model to determine the optimal production volume so that maximum profit is obtained using the CPLEX application. The results of the study showed that to optimize profits, Saveer Hijab must produce 200 pcs of Malay Scarf hijab and 120 pcs of Pashmina Square hijab. Thus, the profit obtained by Saveer Hijab is IDR 7,000,000.00 or 75%. Saveer Hijab obtains maximum efficiency for the amount of fabric and thread inventory, because in the production process of both types of hijab, it requires a fabric inventory of 500 m and a thread of 800 m, which is in accordance with the amount of material availability capacity. Furthermore, the amount of plastic packaging inventory still leaves 180 pcs because in the production process the amount of plastic used is 320 pcs.

Keywords : CPLEX ; MSME ; optimization ; hijab fashion

INTRODUCTION

MSMEs have a major role in economic growth in Indonesia, reaching 99% of all business units. The contribution of MSMEs to GDP also reaches 60.5%, and to labor absorption reaches 96.9% of the total national labor absorption. MSME adopt more workers in need and reduce unemployment rates and improve the welfare of small-scale workers. So that the problem of poverty in Indonesia can be reduced or even disappear. Small and medium-sized industrial sector entrepreneurs must continue to be supported and developed as one of the sectors that supports the Indonesian people's economy so that they can compete, both locally, nationally, and globally (Abidah et al., 2022).

Saveer Hijab is one of the hijab fashion brands in the MSME sector that produces various types of hijab such as Malay Scarf, a square hijab with oval edge finishing and Pashmina Square, a pashmina hijab with edge sewing finishing. The development of the hijab industry in the modern era is currently quite rapid. The latest data from the World Economic Forum (WEF) proves that the average Indonesian spends $ 6.09 to buy more than 1.02 trillion hijabs each year. This data shows that Indonesian people are quite consumptive in hijab fashion. The many hijab trends on social media have become a phenomenon in the world of Muslim fashion and have influenced the development of the fashion industry in Indonesia. This situation is an opportunity for hijab producers in Indonesia. However, in the last few months, the condition of the fashion industry has declined because the number of requests is not balanced with production costs due to the increase in raw material prices.

Indonesia's micro economy faces a number of significant challenges related to people's purchasing power. Although the government estimates that economic growth will be stable between 5.1–5.3%, problems at the micro level still require in-depth attention (Ministry of Trade of the Republic of Indonesia, 2025). The price of raw materials such as cloth has increased from the usual price, requiring companies to optimize the use of resources such as raw materials, time, costs and labor so that there is no waste. Therefore, it is important for companies to make the right calculations and achieve optimal conditions by maximizing profits or minimizing costs incurred in the production process so that companies can maintain the company's sustainability.

Optimization of the production of Saveer Hijab brand square hijab is done using linear programming to find out the most optimal number of products and maximize sales profits. Problem solving using the simplex method with data on the amount of profit obtained as the objective function, while the amount of raw materials as the limitation

function. This study aims to formulate an optimization model to find out the right amount of production so that maximum profit is obtained.

Understanding Models

A model is an analogy and representation of the variables contained in a theory. According to Robins, " a model is an abstraction of reality; a simplified representation of some real-world phenomena ", a model is a representation of some phenomena that exist in the real world. A model is also a design that is specifically made using systematic steps to be applied in an activity. In addition, the model is often called a design that is designed in such a way to be applied and implemented (Mirdad, 2020).

Definition of System

The system is a relationship between one unit and another unit that are interconnected with each other and cannot be separated and lead to a unity in order to achieve previously set goals. For example, if one unit in a company experiences a disruption, the other units will also be disrupted in achieving the goals that have been set. The system consists of three elements, namely: input, process and output. Input is the driving component where the system is operated, output is the result of operations that are the goal or target of operating a system, while the process is an activity that can change input into output (Frisdayanti, 2019).

System Characterization

System characterization refers to the process of identifying, analyzing, and understanding the key attributes of a system. In a general context, characterization includes the study of the structure, function, dynamic behavior, and key parameters of a system in order to describe its performance and operational boundaries (Checkland, 1999). The systems being characterized can be physical, biological, social, or information systems. The purpose of system characterization is to understand the interactions between system components, detect long-term behavioral patterns, identify key parameters that affect system output, and provide a basis for system optimization (Sterman, 2000).

Linear Program

Linear programming is a mathematical technique to maximize the use of resources so that decisions taken by the company can achieve goals. The use of this method will allow for optimizing the use of a material. The linear programming problem is the problem of maximizing profits and minimizing costs. The linear programming strategy is a model for improving asset distribution to achieve the effectiveness of the ongoing arrangement. The most frequently used direct writing of linear programs is in the form of mathematical models because it is more ideal in tracking ideal settings (Pushpavalli et al, 2018).

DEVELOPMENT MODEL

Production planning is used to determine how much product should be produced, as well as what resources are needed so that maximum profit can be obtained (Entezaminia et al., 2017). Proposed production planning model Saveer Hijab brand hijab was founded due to the increase in the price of raw materials for hijab production, so that companies are required to calculate the right amount of production so that it can achieve an optimal condition, namely maximizing profits or minimizing production costs. The following is an example of a conceptual model of production planning Saveer Hijab brand hijab:

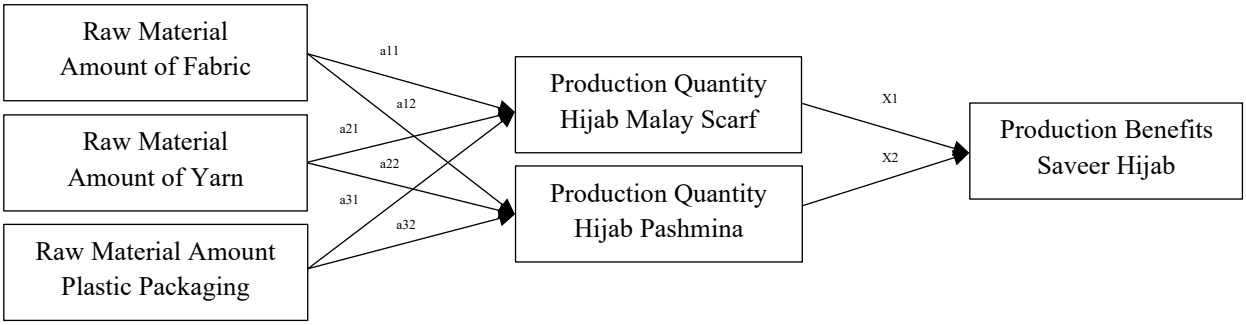

Figure 1. Conceptual Model of Hijab Production Planning by Saveer Hijab

Mathematical Model Development

Mathematical models are a prefix used to assist calculations in decision making on allocating limited resources to produce optimal company goals. The development of mathematical models can be done in the following ways :

a. Define the decision variable, namely the variable whose value will be sought.

b. Formulate the objective function, namely maximization or minimization and determine the decision variable coefficients.
c. Formulate the constraint function, namely determining the resource requirements for each decision variable, then determine the amount of resource availability as a constraint.

Production planning model The Saveer Hijab brand hijab has a problem, namely how the company can find out the most optimal number of products with limited raw materials such as fabric, thread, and plastic packaging as well as working hours to maximize sales profits. If hijab production is carried out without careful planning, then hijab production can result in an imbalance in production and will subsequently have an impact on business unsustainability. Based on this description, the Saveer Hijab brand hijab production planning model was developed based on several assumptions, as follows:

a. The model is a deterministic model
b. Consumer demand is in accordance with the amount of production
c. The raw materials used are in accordance with the capacity provided by the company per month.

Mathematical Model Formulation

Optimization of production profits is carried out by preparing a mathematical model formulation by identifying parameters and decision variables, objective function to maximize or minimize something (quantity), such as profit or costs , and constraint function which limits the level of goal achievement , namely to obtain the greatest possible profit from limitations or constraints .

a. The parameters in the production of Saveer Hijab brand hijab are as follows:
   a_{11} = Amount of raw material needed to make a Malay Scarf hijab
   a_{12} = Amount of raw material needed to make a Pashmina Square hijab
   a_{21} = The amount of raw yarn needed to make a Malay Scarf hijab
   a_{22} = The amount of raw thread material needed to make a Pashmina Square hijab
   a_{31} = The amount of plastic packaging raw materials needed to make the Malay Scarf hijab
   a_{32} = The amount of plastic packaging raw materials needed to make a Pashmina Square hijab
   p_1 = Total profit from Malay Scarf hijab production
   p_2 = Total profit from Pashmina Square hijab production
b. The decision variables in the production of Saveer Hijab brand hijab are as follows:
   x_1 = Total production of Malay Scarf hijab
   x_2 = Number of Pashmina Square hijab production
c. The limitations or constraints in the production of Saveer Hijab brand hijabs are as follows:
   c_1 = Capacity provided according to raw fabric materials per month
   c_2 = Capacity provided according to raw yarn materials per month
   c_3 = Capacity provided according to plastic packaging raw materials per month

So based on the description above, a mathematical model can be formulated for the constraint function as follows:

$$a_{11}x_1 + a_{12}x_2 \leq c_1 \quad (1)$$

$$a_{21}x_1 + a_{22}x_2 \leq c_2 \quad (2)$$

$$a_{31}x_1 + a_{32}x_2 \leq c_3 \quad (3)$$

Formulation of mathematical model a in the production system of Saveer Hijab brand hijab are as follows:

$$Z\max = p_1x_1 + p_2x_2 \quad (4)$$

with,

Zmax = Total profit of Malay Scarf hijab and Pashmina Square hijab
p_1 = Total profit from Malay Scarf hijab production
x_1 = Total production of Malay Scarf hijab
p_2 = Total profit from Pashmina Square hijab production
x_2 = Number of Pashmina Square hijab production

RESULT AND DISCUSSION

Production Data Analysis

Saveer Hijab has two types of hijab products produced, namely Malay Scarf with oval edge finishing and Basic Square with square or box edge finishing. Both types of products have different characteristics and specifications, so customers can choose according to their wishes . In the production process of both types of hijab, Saveer Hijab requires raw materials such as fabric, thread, and plastic packaging. The total capital cost incurred by Saveer Hijab to purchase these raw materials is IDR 4,000,000.00. Furthermore, based on the production data obtained from Saveer Hijab, the decision variables can be identified, namely the main products sold are the Malay Scarf hijab and the Pashmina Square hijab.

a. Benefits of hijab production

The following is a calculation of profits for each type of hijab:

Table 1. Calculation of Saveer Hijab Production Profit

Types of Hijab	Initial capital	Selling price	Profit
Malay Scarf	Rp. 25,000.00	Rp. 45,000.00	Rp. 20,000.00
Pashmina Square	Rp. 30,000.00	Rp. 55,000.00	Rp. 25,000.00

Based on these calculations, the profit obtained for the Malay Scarf hijab is IDR 20,000.00 per piece and the profit obtained for the Pashmina Square hijab is IDR 25,000.00 per piece.

b. Amount of raw materials required

Making both types of hijab requires several raw materials including fabric, thread, and plastic for packaging. The following is a calculation of the raw material requirements for each type of hijab:

Table 2. Calculation of Raw Material Requirements for Saveer Hijab Production

Types of Hijab	Size	Cloth	Thread	Plastic Packaging
Malay Scarf	128 x 128 cm	1.30 m	2.50 m	1 pcs
Pashmina Square	180 x 74 cm	2 m	2.50 m	1 pcs

Based on these calculations, it can be seen that in making 1 piece of Malay Scarf hijab requires a fabric with an area of 1.30 m and 2.50 m of thread. While to make 1 piece of Pashmina Square hijab requires a fabric with an area of 2 m and 2.50 m of thread.

So a production data table was created for making 1 piece of each type of hijab, as follows:

Table 3. Saveer Hijab Production Data

Types of Raw Materials	Hijab Malay Scarf	Hijab Pashmina Square	Inventory Capacity
Raw Materials for Fabric	1.30 m	2 m	500 m
Raw Materials for Yarn	2.50 m	2.50 m	800 m
Plastic Raw Materials for Packaging	1 pcs	1 pcs	500 pcs

Based on the production data, it can be seen that to make 1 piece of each type of hijab, several raw materials are needed in different quantities and must meet the capacity provided by the company.

Objective Function Analysis

The goal of the Saveer Hijab company is to obtain optimal profits by knowing how much production for each type of hijab. For that, a mathematical model is formulated, as follows:

$\text{Zmax} = 20{,}000\ x_1 + 25{,}000\ x_2$

(Maximizing Profit)

Constraint Function Analysis

Limited resources are an obstacle in the hijab production process by Saveer Hijab. For this reason, a mathematical model is formulated for the constraint function, as follows:

$$\begin{aligned} 1.3\ x_1 + 2\ x_2 &\leq 500 \\ 2.5\ x_1 + 2.5\ x_2 &\leq 800 \\ 1\ x_1 + 1\ x_2 &\leq 500 \\ x_1 &\geq 0 \\ x_2 &\geq 0 \end{aligned}$$

Profit Optimization Using CPLEX Application

The solution to optimize the profits obtained by Saveer Hijab for the Malay Scarf and Pashmina Square hijab products using CPLEX is done by entering the objective function and constraint function into the syntax as in Figure 2, as follows:

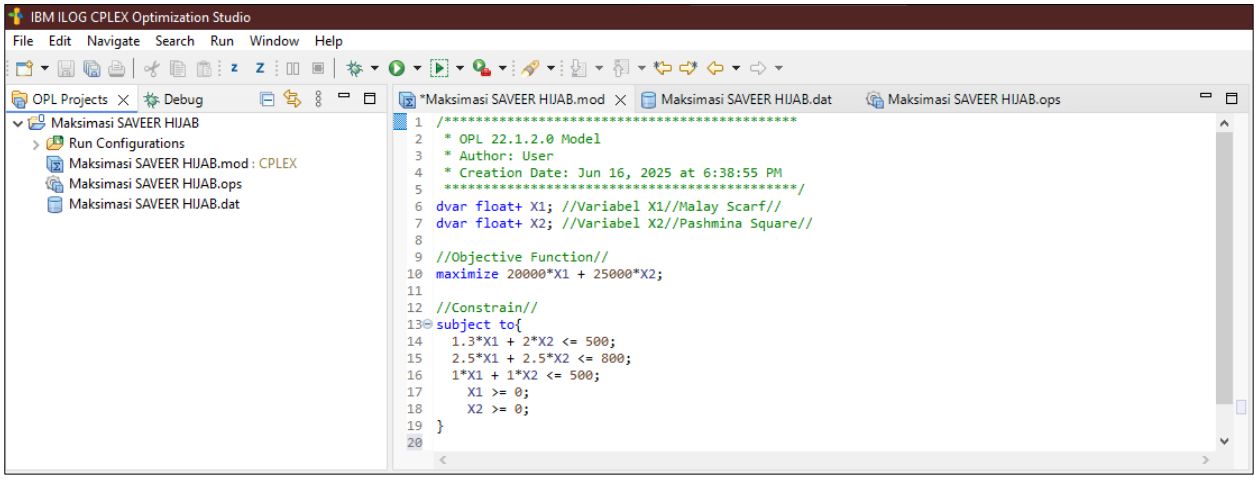

Figure 2. Mathematical Modeling Syntax for Saveer Hijab Production

The results of running CPLEX are as presented in Figure 3 as follows:

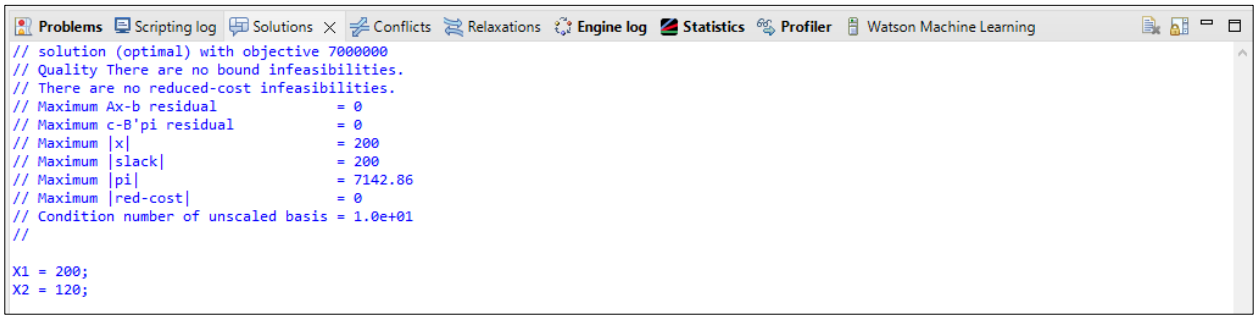

Figure 3. Results of Running Mathematical Modeling for Saveer Hijab Production

Based on Figure 3, it is known that the optimal solution to maximize profits is to produce 200 pcs of Malay Scarf hijab (x_1) and 120 pcs of Pashmina Square hijab (x_2). The sales results and profits obtained are as follows:

Table 4. Sales Results and Profits with Saveer Hijab Production Quantity Solution

Types of Hijab	Selling price	Profit	Production Quantity Solution	Total Selling Price	Amount of Profit
Malay Scarf	Rp. 45,000.00	Rp. 20,000.00	200 pcs	Rp. 9,000,000.00	Rp. 4,000,000.00
Pashmina Square	Rp. 55,000.00	Rp. 25,000.00	120 pcs	Rp. 6,600,000.00	Rp. 3,000,000.00
Total				Rp. 15,600,000.00	Rp. 7,000,000.00

Based on Table 4, it is known that by producing 200 pcs of Malay Scarf hijab (x_1) and 120 pcs of Pashmina Square hijab (x_2), Saveer Hijab gets a total gross sales of Rp15,600,000.00. So from the sale, Saveer Hijab gets a profit of Rp7,000,000.00. As for the use of raw materials are as follows:

Table 5. Use of Raw Materials with Saveer Hijab Production Quantity Solution

Raw material	Hijab Malay Scarf	Hijab Pashmina Square	Inventory Capacity	Amount Used	Remaining Amount
Cloth	1.30 m	2 m	500 m	500 m	0
Thread	2.50 m	2.50 m	800 m	800 m	0
Plastic Packaging	1 pcs	1 pcs	500 pcs	320 pcs	180
Solution Production Quantity	200	120			

Based on Table 5, if Saveer Hijab will produce 200 pcs of Malay Scarf hijab and 120 pcs of Pashmina Square hijab, then the amount of fabric and thread inventory is not left or in an optimum condition, because in the production

process of both types of hijab requires a fabric inventory of 500 m and a thread of 800 m. Furthermore, the amount of plastic packaging inventory still has 180 pcs left because in the production process the amount of plastic used is 320 pcs.

CONCLUSION

Micro, Small, and Medium Enterprises in the hijab fashion industry such as Saveer Hijab produce various types of hijab such as Malay Scarf, a square hijab with oval edge finishing and Pashmina Square pashmina hijab with edge sewing finishing. The initial capital issued by Saveer Hijab is IDR 4,000,000.00. To optimize profits, Saveer Hijab should produce 200 pcs of Malay Scarf hijab and 120 pcs of Pashmina Square hijab. Thus, the profit to be obtained is IDR 7,000,000.00 or reaches 75% of the capital. In the production process based on the proposed production quantity solution, Saveer Hijab obtains maximum efficiency for the amount of fabric and thread inventory, because in the production process of both types of hijab, it requires 500 m of fabric inventory and 800 m of thread, which is in accordance with the amount of material availability capacity. Furthermore, the amount of plastic packaging inventory still has 180 pcs left because in the production process the amount of plastic used is 320 pcs.

Suggestions that can be given to Saveer Hijab are to be able to regulate hijab production into 200 pcs of Malay Scarf hijab and 120 pcs of Pashmina Square hijab. If a mature production planning has been done, then it can reduce the risk of imbalance in production capacity and minimize costs incurred so that Saveer Hijab can maintain business sustainability. In addition, with minimal capital, Saveer Hijab can still maximize profits and not experience difficulties due to rising raw material prices, with the hope that the government can strive for the stability of raw material prices in the market.

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