

Optimization Analysis of Vegetable Farming with Hydroponic System in Kendari City (Case Study of Simbo Hydroponics)

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Abstract

This study aims to analyze the optimal use of production resources in hydroponic vegetable farming in order to maximize income. The research was conducted from February to July 2025. The method used in this study is linear programming analysis using the simplex method, assisted by the POM-QM for Windows IV software to determine the optimal combination of resources, including seeds, nutrients, and labor. The results showed that the use of production resources had reached an optimal condition, with full utilization of nutrients (70 liters) and labor (8 man-days). The resources that remained in surplus and were not limiting factors included lettuce seeds, pakcoy seeds, caisim seeds, samhong seeds, and kailan seeds. Among the five crops, pakcoy still had potential for further optimization, while the other four had already reached optimal levels. Each type of vegetable showed that production quantity matched demand (optimal). The optimal production levels for each crop were: lettuce 60 kg, pakcoy 120.63 kg, caisim 30 kg, samhong 30 kg, and kailan 90 kg. The total optimal income obtained from this combination amounted to IDR 10,201,148 per production cycle.

Keywords: Hydroponics, Maximum Profit, Linear Programming, Optimization, Production Resources

INTRODUCTION

Indonesia is known as an agrarian country that relies on the agricultural sector, both as a source of livelihood and as a pillar of national development. Agricultural technology has been developed to simplify, accelerate, and improve production, including through the mastery of

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efficient cultivation techniques and the application of new innovations (Hendra et al., 2023). One of the main challenges facing the agricultural sector today is the limited availability of productive land, which has driven the utilization of marginal lands such as peatlands to expand cultivated areas. However, with advancements in technology, land scarcity is no longer a significant barrier, as methods of cultivation that do not require extensive land have been developed, one of which is the hydroponic system (Melina et al., 2024).

Hydroponics is a technique of growing plants without using soil, instead utilizing a mineral nutrient solution as a source of nutrients (Puspitasari et al., 2024). This method is considered capable of producing vegetables of higher quality, with high efficiency, and the potential to increase sales revenue (Radinka et al., 2023). The advantages of hydroponics include not requiring extensive land, efficient water use, and ease of control in terms of nutrient supply, water circulation, and maintenance of the growing medium. In Indonesia, hydroponic technology was first introduced in the 1970s and has developed industrially since 1982. Population growth, urbanization, and the conversion of agricultural land into residential areas and urban infrastructure have driven the development of hydroponics as a solution for urban food production (Subandi et al., 2020).

This trend is also evident in Kendari City, Southeast Sulawesi, which began implementing hydroponic systems in 2017 and has received support from the Agriculture Department since 2019. According to data from the Kendari City Agriculture Department (2022), there are 39 hydroponic business groups with participants from various backgrounds, including farmers, civil servants, lecturers, and students (Widyantari et al., 2024).

One of the hydroponic-based horticultural centers in Kendari City is Watubangga Village, which is the location of the Simbo Hydroponic Farm. Established in 2019, Simbo Hydroponic Farm produces various types of vegetables such as pakcoy, lettuce, samhong, caisim, and kailan. Despite its growing production, preliminary surveys indicate managerial issues, including the selection of crop types based solely on estimated demand, which sometimes leads to overproduction of one vegetable type and shortages of others. Additionally, the available land area is not proportional to the number of workers, resulting in suboptimal operational efficiency. These challenges can impact company revenue, necessitating the implementation of appropriate production planning strategies. Optimizing the use of resources such as seeds, nutrients, and labor is key to achieving maximum income. One relevant analytical method for this problem is Linear Programming using the Simplex method, which can help determine the optimal production combination given resource constraints.

Based on the above, this study was conducted with the title "Analysis of Optimal Vegetable





Farming with Hydroponic Systems in Kendari City (Case Study of Simbo Hydroponics)” with the problem statement of how to optimally use production resources (seeds, nutrients, and labor) in vegetable farming with hydroponic systems, as well as how much production of each type of vegetable can be obtained to maximize income. The objectives of this study are to analyze the optimal use of production resources (seeds, nutrients, and labor) and to determine the production levels for each type of vegetable that can provide maximum income for hydroponic vegetable farming.

METHOD

This study was conducted on Simbo Hydroponic Vegetable Farming in Watubangga Village, Baruga District, Kendari City, Southeast Sulawesi. The location was chosen because it produces hydroponic vegetables such as lettuce, pakcoy, caisim, samhong, and kailan. The study was conducted from October 2024 to June 2025.

The research targets the business owners and workers directly involved in the business. The types and sources of data in this study are primary and secondary data. Data collection techniques in this study include observation, which is direct observation of the research object; interviews, which are direct interactions with informants such as business owners and workers using a questionnaire or interview guide; and literature review, which is the collection of data from various relevant sources through reading and recording information related to the study.

The first objective of this study is to analyze the optimal use of resources (planting holes, seeds, nutrients, and labor) in increasing the income of Simbo Hydroponics through a quantitative approach with optimality analysis using linear programming with the help of POM-QM For Windows IV. In solving linear programming, there are three main elements, namely decision variables, objective functions, and constraints or limitations. The following is the formulation of the model for Simbo Hydroponics, which will be explained as follows:

- Decision Variables:
Formula : X_1, X_2, X_3, X_4, X_5
 X_1 = Lettuce
 X_2 = Pak choy
 X_3 = Samhong
 X_4 = Caisim
 X_5 = Kailan
- Objective Function: Maximize/Minimize Revenue
 $Z = C_1X_1 + C_2X_2 + C_3X_3 + C_4X_4 + C_5X_5$
Notes:



z = Maximum Revenue

C_j = contribution of vegetable j to revenue

X_j = vegetable group j

- vegetable group j :

Planting Hole Constraint $\sum a_j X_j \leq b$

$$a_1 X_1 + a_2 X_2 + a_3 X_3 + a_4 X_4 + a_5 X_5 \leq b$$

Seed Constraint $\sum d_j X_j \leq e$

$$d_1 X_1 + d_2 X_2 + d_3 X_3 + d_4 X_4 + d_5 X_5 \leq e$$

Nutrient Constraint $\sum f_j X_j \leq g$

$$f_1 X_1 + f_2 X_2 + f_3 X_3 + f_4 X_4 + f_5 X_5 \leq g$$

Labor Constraints $\sum k_j X_j \leq l$

$$k_1 X_1 + k_2 X_2 + k_3 X_3 + k_4 X_4 + k_5 X_5 \leq l$$

$X \geq$ Lettuce, pakcoy, caisin, samhong, and kailan.

Notes:

b = Planting Hole (Hole)

e = Seed availability for each vegetable (kg)

g = Nutrient availability (L)

l = Availability of labor (HOK)

a_j = Technical coefficient (planting hole) for 5 types of vegetables

d_j = Technical coefficient (seeds) for 5 types of vegetables

f_j = Technical coefficient (nutrition) for 5 types of vegetables

k_j = Technical coefficient (labor) for 5 types of vegetables

The second objective of this study is to analyze the production levels of each vegetable type to determine the maximum income achievable in a hydroponic vegetable farming business, using income analysis. The income sources of Simbo Hydroponics come from the production of 5 types of vegetables, namely lettuce, pakcoy, caisim, samhong, and kailan. To calculate the income of the hydroponic farming business, the following income formula will be used (Husain & Amran, 2024). Hydroponic Farming Income Formula:

$$\pi = TR - TC$$

$$\pi = (Y \cdot P_y) - (TVC + TFC)$$

$$\pi = (Y_1 \cdot P_{y1} + Y_2 \cdot P_{y2} + Y_3 \cdot P_{y3} + Y_4 \cdot P_{y4} + Y_5 \cdot P_{y5}) \{ (X_1 \cdot P_1 + X_2 \cdot P_2 + X_3 \cdot P_3 + X_4 \cdot P_4 + X_5 \cdot P_5) + D \}$$

Notes:

P_d = Hydroponic business income (Rp/kg)

TR	= Total Revenue (Rp/kg)
TC	= Total Cost (Rp/Kg)
TVC	= Total Variable Cost (Rp/kg)
TFC	= Total Fixed Cost (Rp/kg)
Y	= Production of each of the 5 types of vegetables (Rp/kg)
P_y	= Price of 5 types of vegetables (Rp/kg)
X	= Total production input of 5 types of vegetables (kg)
P	= Input price of 5 types of vegetables (Rp/kg)
D	= Depreciation of equipment (Rp/kg)

RESULTS AND DISCUSSION

Production Factors

Simbo Hydroponics is a hydroponic farming business that produces several types of vegetables such as pakcoy, lettuce, samhong, caisim, and kailan. Producing these products requires production factors such as planting holes, seeds, nutrients, and labor.

1. Planting holes play a crucial role in the efficiency and success of hydroponic cultivation as they serve as the growing medium and support for roots to remain in the nutrient solution. Proper design regarding the number, size, and spacing of planting holes ensures plants receive optimal nutrients, light, and oxygen. Simbo Hydroponics has approximately 5,000 planting holes spaced 16 cm apart on a 300 m³ plot, comprising 1,002 holes (72 m³) for lettuce, 1,367 holes (52 m³) for pakcoy, 749 holes (52 m³) for caisim, samhong (655 holes, 52 m³), and kailan (1,227 holes).
2. High-quality seeds are a crucial factor in determining vegetable production outcomes. At Hidroponik Simbo, Mr. Amir Salim selects the best seeds before sowing them simultaneously for pakcoy, lettuce, samhong, caisim, and kailan. The types of seeds used include Bejjo lettuce at Rp35,000 per pack (0.25 kg), Panah Merah pakcoy at Rp35,000 per pack (0.01 kg), Panah Merah caisim at Rp40,000 per pack (0.15 kg), samhong Panah Merah at Rp65,000 per pack (0.01 kg), and kailan Panah Merah at Rp22,000 per pack (0.005 kg). Based on Table 1, the seed usage in Simbo Hydroponics is as follows: lettuce averages 0.00042 kg from the available 0.25 kg, pakcoy 0.00029 kg from 0.04 kg, caisim 0.00062 kg from 0.03 kg, samhong 0.00055 kg from 0.03 kg, and kailan 0.00034 kg from 0.1 kg. The amount of seeds used is adjusted according to the number of planting holes and the distance between holes, set at 16 cm for all types of plants.

3. Fertilizer/Nutrients are a mixture of nutrients required by plants, typically using solid **AB Mix** fertilizer dissolved according to the manufacturer's recommendations. This fertilizer contains macro nutrients (N, P, K, Ca, Mg, S) and micro nutrients (Cu, Mn, Zn, Fe) essential for plant metabolism (Syariefa, 2015). Simbo Hydroponics uses AB Mix from CV. Family Garden Mart at a price of Rp130,000 per pack. For five types of plants, 7 packs of AB Mix are used, equivalent to 70 liters of nutrients, with 14 liters each for lettuce, pakcoy, caisim, samhong, and kailan.
4. Labor is one of the important production factors alongside land, capital, and management, which must be considered in terms of quantity, quality, and type (Nasional, 2019). In hydroponic farming, Simbo Hydroponics carries out all processes from land preparation to harvesting using labor from family members, totaling four people. No external labor is employed as the entire land area and production activities can be managed independently. Labor measurement is conducted in units of Labor-Hours (LH), where 1 LH is equivalent to 8 hours of work per day. The value of LH usage is obtained by dividing the total working hours by the number of plants produced in a single production process. The total labor use at Simbo Hydroponics is 8 HOK, with the following breakdown: lettuce 1.5 HOK, pakcoy 2.9 HOK (the largest), caisim 0.7 HOK, samhong 0.7 HOK, and kailan 2.2 HOK (Table 1).

Table 1. Average seed and labor use for 5,000 planting holes

Crop Type	Seeds Used (kg)	Seed Availability (kg)	Seed Price (Rp)	Labor (HOK)	Percentage (%)
Lettuce	0.00042	0.25	35,000	1.5	1
Pakcoy	0.00029	0.04	35,000	2.9	37
Chinese cabbage	0.00062	0.03	40,000	0.7	9
Samhong	0.00055	0.03	65,000	0.7	9
Kailan	0.00034	0.10	22,000	2.2	27
Total	-	-	-	8.0	10

Costs and Income

At Simbo Hydroponics, most of the labor comes from family members, so there are no direct labor costs. The largest income is derived from crops with high productivity and market demand, such as pakcoy and lettuce, while the largest expenses are allocated to the purchase of AB Mix nutrient solution.



1. Fixed costs are costs that are not affected by production volume and must be incurred every production period, regardless of whether production volume is high or low (Arfah et al., 2020; Adolph, 2016). At Simbo Hydroponics, the total fixed costs incurred are Rp39,835/month from the total production equipment cost of Rp39,149,000. The depreciation costs for the five types of plants are the same because the equipment is used together, so depreciation costs and other costs are included in the fixed costs (fixed cost).
2. Variable costs are costs influenced by the scale of production and are consumed in a single production process, consisting of production inputs, labor costs, and interest on capital (Arfah et al., 2020). These costs increase with rising activity levels and decrease when activity levels decline, with the total varying proportionally with the volume of activity but remaining constant per unit. At Simbo Hydroponics, the total variable costs per growing season (± 45 days) amount to Rp2,682,000, including plant seeds (lettuce, pakcoy, caisim, samhong, kailan), AB mix nutrients, electricity, germination sponges, transparent plastic, packaging bags, and distribution fuel. Among the five types of plants, the highest cost comes from pakcoy (Rp975,000), followed by kailan (Rp732,000), lettuce (Rp487,250), samhong (Rp243,750), and caisim (Rp243,750) (Table 2)
3. Total costs are the total expenses incurred to produce the output. This is the sum of fixed costs and variable costs. The total production costs for the five types of plants produced by Hidroponik Simbo show that the fixed costs amounted to Rp39,835, while the variable costs reached Rp2,742,000. Thus, the total production costs for one month were Rp2,721,835.
4. Revenue is the result of multiplying the quantity of products produced per production cycle by the selling price per unit set by the company in Indonesian Rupiah (Rahmat *et al.*, 2017). Table 2 shows that Simbo Hydroponics produces five types of plants, with the highest revenue generated from pakcoy plants, totaling Rp5,400,000, and the lowest revenue from caisim and samhong plants, totaling Rp900,000. The total revenue of Simbo Hydroponics is Rp12,900,000.
5. The amount of income received by respondents is not only influenced by the quantity of production but also by the selling price and the amount of costs incurred. Based on Table 2, the selling price of each type of plant was calculated by comparing the total income per unit with the production quantity per kilogram in one month of production. The results show that pakcoy plants generated the highest income of Rp4,409,567, followed by kailan at Rp2,859,030, lettuce at Rp1,604,784, and caisim and samhong, each generating income of Rp652,392.



Table 2. Production, selling price, revenue, production costs, and income for each type of hydroponic crop at Hidroponik Simbo per month.

Type of Crop	Production (kg/month)	Selling Price (Rp/kg)	Revenue (Rp/Month)	Production Costs (Rp/Month)	Income (IDR/Month)
Lettuce	60	35	2,100	495,216	1,604,784
Pakcoy	120	45,000	5,400,000	990,433	4,409,567
Chinese cabbage	30	30,000	900,000	247,608	652,392
Samhong	30	30,000	900,000	247,608	652,392
Kailan	90	40,000	3,600,000	740,970	2,859,030
Total	330	-	12,900,000	2,721,835	10,178,165

Formulation in Linear Programming

To solve this problem, the following steps are taken using *linear programming* with the help of the POM-QM For Windows IV application:

1. The objective function represents the revenue from each type of crop cultivated. Revenue is calculated as the difference between the selling price and the total cost per unit of each type of crop produced. Where the income for lettuce is Rp1,604,784, pakcoy is Rp4,409,567, caisim is Rp652,392, samhong is Rp652,392, and kailan is Rp2,859,030. The objective function is written as follows:

$$Z = 26.745x_1 + 36.745x_2 + 21.745x_3 + 21.745x_4 + 31.745x_5$$

2. Challenges/Limitations: Simbo hydroponics faces challenges and limitations in its production process. These challenges/limitations include production resources such as planting holes, seeds, nutrients, and labor. The use of production resources is detailed in Table 3

Table 3. Use of Production Resources

Production Factors	Variables					Availability
	X ₁	X ₂	X ₃	X ₄	X ₅	
Planting hole	16	11	24	21	13	5.000
Lettuce seeds	0,00042	0	0	0	0	0,25
Pakcoy seeds	0	0,00029	0	0	0	0,04
Caisim seeds	0	0	0,00062	0	0	0,03
Samhong seeds	0	0		0,00055	0	0,03

Kailan seeds	0	0	0	0	0.00034	0,1
Nutrition	0,23	0,16	0,35	0,31	0,19	70 L
Labor	0,033	0,033	0,033	0,033	0,033	11
Production Limit						
Lettuce	60					Kg
Pakcoy plants		120				
Caisim plants			30			
Samhong plants				30		
Kailan plants					90	

The constraint functions are written as follows:

1. Planting Hole = $16x_1 + 11x_2 + 24x_3 + 21x_4 + 13x_5 \leq 5,000$
2. Lettuce Seeds = $0.00042x_1 \leq 0.25$
3. Pak Choi Seeds = $0.00029x_2 \leq 0.04$
4. Caisim Seeds = $0.00062x_3 \leq 0.03$
5. Samhong seeds = $0.00055x_4 \leq 0.03$
6. Kailan seeds = $0.00034x_5 \leq 0.1$
7. Fertilizer = $0.23x_1 + 0.16x_2 + 0.35x_3 + 0.31x_4 + 0.19x_5 \leq 70$
8. Labor = $0.025x_1 + 0.024x_2 + 0.023x_3 + 0.023x_4 + 0.024x_5 \leq 8$
9. Lettuce Production = $x_1 \geq 60$
10. Pakcoy Production = $x_2 \geq 120$
11. Caisim Production = $x_3 \geq 30$
12. Samhong Production = $x_4 \geq 30$
13. Kailan Production = $x_5 \geq 90$

Linear Programming Analysis Results

Based on the analysis conducted using the POM-QM for Windows software, the use of resources in Simbo Hydroponics is relatively optimal, resulting in optimal income for the respondents. The optimal results obtained using the *linear programming* model show the optimal solution consisting of the combination of vegetable levels, resource status, and sensitivity analysis. The following are the results of the *linear programming* analysis conducted.

1. *Primal* Analysis Results (Optimal Production Level Combination).

Table 4 shows the optimal production combination based on data processing results using the POM-QM for Windows software, where the number of plants that should be

produced to achieve optimal conditions is 120.63 pakcoy plants in one growing season. This production combination yields the maximum revenue for Hidroponik Simbo, amounting to Rp10,201,148. This optimization is determined based on the price and quantity of each vegetable type that can generate the highest revenue, then compared with the actual production levels to identify the difference between the ideal and actual conditions in the field.

Additionally, the production levels under actual and optimal conditions show the comparison between actual and optimal production levels, where most vegetable types have actual production levels matching the optimal levels. Only pakcoy has a positive difference of 0.63 kg, indicating its production exceeds the optimal level. This optimization assumption is that all crops produced can be sold at the determined price per kilogram. If following the optimal plan, the company's income per growing season per month can reach Rp10,201,148, slightly higher than the actual income of Rp10,178,165, with a difference of Rp22,983 or 0.22%. This difference indicates that actual and optimal revenue are not significantly different, despite variations in production quantities for certain vegetable types such as lettuce, pakcoy, caisim, samhong, and kailan, which can reach 0.63 kg. According to Amien and Mukodim in Iftitah (2017), production optimization is a process of finding the best solution, where the highest income is not always the primary goal if the focus of optimization is to maximize income efficiency

Table 4. Comparison of optimal income and actual production conditions, as well as production differences for each type of hydroponic crop at Hidroponik Simbo.

Crop Type	Price (Rp/kg)	Revenue (Rp/kg)	Actual Conditions (Kg)	Optimal Value (kg)	Production Difference (kg)	Total Actual Revenue (Rp)	Total Optimal Income (Rp)
Lettuce	35,000	26,745	60	60	-	1,604,784	1,604,784
Pakcoy	45,000	36,745	120,00	120.63	0.63	4,409,567	4,432,550
Chinese cabbage	30,000	21,745	30,0	30	-	652,392	652,392
Samhong	30,000	21,745	30	30	-	652,392	652,392
Kailan	40,000	31,745	90	90.00	-	2,859,030	2,859,030
			330	330.63	0.63	10,178,165	10,201,148

2. Dual Analysis (Resource Status Assessment)

The analysis results in Table 5 show that optimal resource allocation occurs in nutrients with a slack/surplus value of 0, meaning that all resources are fully utilized. Adding 1 unit of nutrients can increase income by Rp229,656. Meanwhile, other resources such as planting holes, seeds of various types of vegetables (lettuce, pakcoy, caisim, samhong, kailan), and labor have a dual value of 0 with varying slack/surplus, indicating an excess supply compared to the actual needs of respondents.

After analyzing the resource status, a demand analysis was conducted. Table 5 shows that only pakcoy has a slack/surplus of 0.63 kg, indicating there is still potential to increase production; however, this was not pursued as allocation was directed toward more profitable crops. Lettuce, caisim, samhong, and kailan have a slack/surplus of 0, meaning production is already optimal according to demand. The dual value indicates that increasing production by 1 kg would reduce income by Rp26,075.94 (lettuce), Rp58,634.69 (caisim), Rp49,448.44 (samhong), and Rp11,889.69 (kailan). Comparing the dual value with the selling price per kilogram provides insight into whether market expansion is necessary to increase demand for each type of crop.

Table 5. Data on Resource Use and Demand in Simbo Hydroponics

Categories	Description	Availability	Dual Value (Rp)	Slack/Surplus
Sumber Daya Input	Planting Hole	5,000	0	193
	Lettuce Seeds	0.25	0	0
	Pak Choi Seeds	0	0	0
	Caisim seeds	0	0	0
	Samhong seeds	0	0	0
	Kailan seeds	0	0	0.07
	Nutrients	7	229,656.30	0
	Labor	11	0	0.06
Jenis Tanaman	Lettuce	-	-26.075.94	0
	Pak Choi	-	0	0.63
	Chinese cabbage	-	-58.634.69	0

	Samhong	-	-49.448.44	0
	Kailan	-	-11,889.69	0

3. Sensitivity Analysis

Siswanto in Iftitah (2017) defines sensitivity analysis as an analysis that explains the extent to which *linear programming* parameters, namely the coefficients of the objective function and the right-hand side values of the constraints, can change without affecting the optimal answer or optimal solution.

The results of the sensitivity analysis of the objective function indicate variations in income for several types of crops produced. For pakcoy, the lower bound is Rp26,732.63 and the upper bound is infinity, indicating unlimited income potential without changing the optimal conditions. Lettuce has a lower bound of $-\infty$ and an upper bound of Rp52,820.94; caisim has a lower bound of $-\infty$ and an upper bound of Rp80,379.69; samhong has a lower bound of $-\infty$ and an upper bound of Rp71,193.44; and kailan has a lower bound of $-\infty$ and an upper bound of Rp43,634.69. The value $-\infty$ at the lower limit indicates that respondents may choose not to meet the income from that crop, while the upper limit listed represents the maximum income that can be achieved without affecting optimal conditions (Table 6).

The results of the sensitivity analysis on the right-hand side of the resource constraints show that the planting holes have a lower bound of 4,806.88 holes, lettuce seeds 0.25 kg, pakcoy seeds 0.03 kg, caisim seeds 0.02 kg, samhong seeds 0.02 kg, kailan seeds 0.01 kg, nutrients 69.9 liters, and labor 7.98 hours, while all others (except nutrients) have an upper limit of infinity. Nutrients have an upper limit of 70.43 liters, while labor must be at least 9.98 hours (± 4 people) to maintain optimal conditions. Adding resources above the lower limit does not affect optimality, but exceeding the limit may increase variable costs. In the demand constraints, pakcoy has a lower limit of $-\infty$ and an upper limit of 120.63 kg, while lettuce, caisim, samhong, and kailan have lower limits of 53.81 kg; 27.72 kg; 27.11 kg; and 75.56 kg, and upper limits of 60.43 kg; 30.29 kg; 30.32 kg; and 90.53 kg, respectively. Demand within the lower–upper range does not alter the optimal conditions, while demand outside this range has the potential to change the optimal solution.

Table 6. Sensitivity Analysis of the Objective Function and Right-Hand Side

Categories	Description	Original Value	Lower Bound	Upper Bound
Plant Type	Lettuce	26,745	–infinity	52,820.94
	Pak Choi	36,745	26,732.63	infinity
	Caisim	21,745	–infinity	80,379.69
	Samhong	21,745	–infinity	71,193.44
	Kailan	31,745	–infinity	43,634.69
Production Resources	Planting Holes	5,000	4,806.88	infinity
	Lettuce Seeds	0.25	0.03	infinity
	Pak Choi Seeds	0.04	0	infinity
	Caisim seeds	0.03	0.02	infinity
	Samhong seeds	0.03	0.02	infinity
	Kailan seeds	0.1	0.01	infinity
	Nutrients	7	69.90	70.43
	Labor	8	7.94	infinity
	Lettuce Production	60	53.81	60
	Pakcoy Production	120	–infinity	120.63
	Caisim production	30	27.72	30.29
	Samhong production	30	27.11	30.32
	Kailan production	90	75.56	90.53

CONCLUSION

Based on the research findings, it can be concluded that the optimal use of production resources in Simbo Hydroponic Vegetable Farming with 5,000 planting holes is as follows: (i) lettuce seeds 0.03 kg, pakcoy seeds 0.03 kg, caisim seeds 0.02 kg, samhong 0.02 kg, kailan seeds 0.01 kg; (ii) nutrients 69.9 L; (iii) labor 7.94 HOK.

Production to achieve maximum income (Rp10,201,148) is as follows: (i) lettuce production 60 kg, (ii) pakcoy production 120.63 kg, (iii) caisim production 30 kg, (iv) samhong production 30 kg, (v) kailan production 90 kg.

Based on the research findings, it is recommended that Simbo Hydroponics develop a production plan to optimize resource utilization, reduce excess resources to minimize costs, and adjust the output combination according to the results of the simplex method linear programming

analysis. The government is encouraged to support farmers and small and medium-sized entrepreneurs in Kendari City to optimize income from hydroponic vegetable farming using the method. Further research is recommended to examine the optimization of farming operations during each growing season to identify optimal conditions throughout the year

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