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Hydroponic Cultivation business of Lettuce (*Lactuca sativa* L.) at BBPP Ketindan Lawang Malang

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ABSTRACT

The need for food such as vegetables is increasing along with the growing population. However, the high demand for lettuce is not matched by the expansion of the area of agricultural land, which is actually getting narrower. Utilization of narrow land in lettuce cultivation can use a hydroponic system which has become an increasingly popular choice for farmers and consumers. The research was conducted on January 2, 2023, at the Ketindan Agricultural Training Center (BBPP). Observations were made when the lettuce was 7, 14, 21 and 35 DAP (Day After Planting) with measurement parameters namely number of leaves, plant height, and farming analysis. The results of observations made on hydroponically cultivated lettuce at the age of 35 DAP had an average number of leaves of 15.74 with the highest number of leaves being 19 and the least being 14. Lettuce plants have an average height of 18.81 cm, with the highest plant being 22.5 cm and the lowest being 17 cm. the profit earned is Rp. 284,070 in each harvest. The value of hydroponic lettuce farming is profitable because the R/C ratio reaches 2.32. The growth in height of lettuce plants is directly proportional to the increase in the number of leaves of lettuce plants and the cultivation of lettuce plants that have been carried out can be categorized as profitable because the value of the R/C ratio is more than 1.

Keywords: Lettuce plants, farming business, hydroponics

Introduction

Lettuce is a vegetable that has high economic value, the development of lettuce cultivation has good prospects because it can increase farmers' income and be a source of community nutrition. Lettuce is one of the most popular types of vegetables and many restaurants, cafes, and food stalls offer dishes that contain lettuce as the main ingredient. The demand for lettuce continues to increase because people are increasingly concerned about a healthy lifestyle and a balanced diet. According to Abraham et al. (2021), lettuce cultivation has quite promising market opportunities, in terms of affordable prices and the need for lettuce, thereby opening greater opportunities for farmers to increase lettuce production.

Narrow land can be a potential source of good quality lettuce if properly managed and managed. Hydroponic system technology can be a solution in dealing with the problem of narrowing agricultural land that has been converted into housing. According to Zahra et al. (2023), lettuce cultivation can be applied to a hydroponic system because it uses water as a planting medium so that it can replace soil as the planting medium. The hydroponic cultivation system is the best solution in the world of modern

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agriculture to address the supply of lettuce because it can grow plants without using soil media. Hydroponic lettuce cultivation has several methods, each of which has advantages and disadvantages.

The advantage provided by the hydroponic system compared to conventional cultivation is that the water used in the hydroponic system can be recycled and carefully controlled to provide optimal nutrition for plants. Another advantage is that the hydroponic system can make it easier for plants to receive nutrients efficiently so that growth and harvest can be faster, and the quality of the harvest can be superior to conventional cultivation. According to Waluyo et al. (2021), Hydroponics has advantages, such as plants that can produce high quality and quantity, are rarely attacked by pests because they are protected, provision of irrigation water and nutrient solutions is more efficient and effective, and can be cultivated continuously without being dependent on season, and can be applied to narrow land. However, the hydroponic system has drawbacks, namely requiring a larger initial capital compared to conventional methods.

Based on the explanation above, it is necessary to conduct experiments on hydroponic lettuce cultivation whether it is profitable or not.

Material and Methods

The research was conducted from January 2 – February 28, 2023, at the Ketindan Agricultural Training Center (BBPP) Ketindan Village, Lawang District, Malang Regency, East Java Province. This study used tools and materials in the form of curly lettuce seeds of the Batavia variety, Rockwool, AB-Mix nutrition, hydroponic installations, net pots, aerators, TDS meters, trays, packaging, scales, rulers/meters, and stationery. Data collection was carried out by direct observation from the nursery to harvest, as well as marketing. Observations were made when the lettuce was 7, 14, 21, and 35 HST with measurement parameters namely number of leaves, plant height, and farming analysis.

Analysis of hydroponic lettuce cultivation farming can be known through calculations with the following formula:

TC = FC + VC

TR = P x Q

π = TR – TC

$$R/C\ Ratio = \frac{TR}{TC} \quad (1)$$

Explanation:

TC = (Total Cost)

TR = (Total Revenue)

π = (Profit)

R/C = (Profit)

FC = (Fix Cost)

VC = (Variable Cost)

P = (Price)

Q = (Quantity)

Results and Discussion

Number of leaves

The results of observing the number of leaves on hydroponically cultivated lettuce plants can be seen in Table 1. The data is the average of the observed data from 20 plant samples at various ages of observation. Table 1. Shows the growth process of the parameters of the number of leaves of lettuce plants which increased from 7 – 35 DAP (Day after Planting). The results of observations made on lettuce plants cultivated hydroponically at the age of 35 DAP had an average number of leaves of 15.74 with the highest number of leaves being 19 and the least being 14. The number of hydroponic lettuce

leaves that have been carried out can be categorized as good. According to research conducted by Laksono (2020), the number of hydroponic lettuce leaves at the age of 35 DAP has an average of 11-13 strands.

Table 1. The average number of lettuce leaves at various ages of observation

Number of Leaves at Various Ages of Observation (strands)					
Plant Samples	DAP (Days After Planting)				
	7	14	21	28	35
1	3	7	12	14	15
2	4	7	12	14	16
3	4	7	11	13	15
4	4	7	11	14	17
5	4	6	11	13	15
6	3	6	12	14	15
7	4	6	12	13	14
8	5	7	13	15	17
9	3	6	11	14	16
10	3	6	11	13	15
11	4	7	13	16	18
12	5	7	12	16	19
13	3	6	12	15	17
14	3	6	11	14	17
15	3	7	12	13	14
16	4	6	11	13	15
17	3	5	11	13	15
18	3	7	13	15	17
19	3	6	12	14	15
20	4	6	11	13	14
Average	3,60	6,40	11,67	13,92	15,74

The increase in the number of leaves can be influenced by nutrition, light, and very supportive environmental factors. The increase in the number of leaves of lettuce plants can be influenced by factors such as light, water availability, and adequate nutrition. These conditions are needed so that plants can carry out photosynthesis which can support the growth of plant cells. The increase in the number and size of leaves can also be influenced by the availability of sufficient nitrogen so that the leaves can grow and have a fresh green color. This is also in line with the opinion of Meriaty (2021) who said that the growth of plant leaves can be affected by the availability of nitrogen, if nitrogen elements are deficient it can inhibit the growth of these plant leaves.

Plant height

The results of observations of plant height in hydroponically cultivated lettuce can be seen in Table 2. The data is the average of the observed data from 20 plant samples at various ages of observation. Table 2. Shows the growth process of lettuce plants which can be viewed from the increase in plant height. The results of measuring the height of lettuce plants using hydroponics had an average height of 18.81 cm, with the highest plant being 22.5 cm and the lowest being 17 cm. The lettuce plants that have been measured are still relatively medium, this can be proven from the height of the lettuce plants in general which can reach 15 – 30 cm. The results of observing the growth of hydroponic lettuce plants carried out by Rahayu, (2022), obtained that the height of lettuce plants could reach 27 – 30 cm.

Table 2. Average height of lettuce plants at various ages of observation

Plant Samples	Plant Height at Various Ages of Observation (cm)				
	DAP (Days After Planting)				
	7	14	21	28	35
1	7	10	14	16	17
2	10,5	12	16,5	18	19,5
3	7	10	15	16	17
4	7,5	12	16,5	18	19
5	7	10	14,5	16,5	18
6	7	10	14	16	17
7	8,5	10,5	13	15	16,5
8	9	12,5	16	18	20
9	7,5	11	15,5	17	18
10	8,5	10	14	16	17,5
11	10,5	13	17	19	21
12	11	14,5	18	20	22,5
13	8	12	16	18	20
14	9	12,5	16	17,5	19,5
15	7	10	14	16	17
16	9	13,5	17	19	20,5
17	8	12	15	17	18
18	9,5	13,5	17	19	21
19	9,5	12,5	16	18	19,5
20	8	12	16	17,5	19
Average	8,50	11,60	15,53	17,35	18,81

The growth in height of lettuce plants is directly proportional to the increase in the number of leaves of lettuce plants. The more the number of plant leaves, the faster the growth of the plant. This is because the leaves are where the process of photosynthesis occurs. The process of photosynthesis produces glucose as an energy source that can be used for cell division. In the opinion of Maulana et al. (2020), the addition of plant height can directly increase the influence of the number of leaves containing chlorophyll pigments which function to absorb light for use in the process of photosynthesis to produce glucose.

Farming business analysis

The yields of lettuce plants and results of farming analysis calculations can be seen in Table 3. The data is a breakdown of income and expenditure. In Table 3 it can be explained that the yields of hydroponic lettuce cultivation in one installation reach 27 kg per installation with a total of 40 plants per elongation and each installation consists of 4 elongations so that the total number of lettuce plants is 160 plants. The yield of hydroponic lettuce that can be harvested is higher than conventionally, this is because the intensity of pest and disease attacks on hydroponic lettuce cultivation is lower than conventional, as well as adequate and balanced nutrition for lettuce growth. The average weight of lettuce plants was 27 kg/160 plants = 168.7 grams per plant. The results of hydroponic lettuce plants compared to conventional crop yields are better. This is by the opinion of Kirnadi et al. (2022) which states that the average weight of conventionally cultivated lettuce only reaches 107.5 grams. This can be caused by the hydroponic system using AB-Mix as a source of nutrients consisting of macro and micro elements needed by plants. AB-Mix nutrients are more easily absorbed by plants because AB-Mix nutrients are able to dissolve well in water.

Table 3. Farming business analysis

Item	Quantity	Price (Rp)	Input	Output
Income				
- Middleman	10 Kg	16.000 /kg	160.000	
- Retail	17 Kg (34 Pcs)	10.000 /pcs	340.000	
Expenses				
Operating costs				
- Water cost				50.000
- Electricity cost				40.000
- Seeds	100 pcs	60 /pcs		6.000
- AB Mix	1 pcs	17.000 /pcs		17.000
- Rockwool	1 pcs	16.000 /pcs		16.000
- Packaging	20 pcs	450 /pcs		9.000
Cost of depreciation	(Depreciation 5 years = item price / 5 / 12)			
- Paralone 3"	11 pcs	170.000 /pcs		31.166
- Paralone 2"	2 pcs	120.000 /pcs		4.000
- Galvalume C	11 pcs	85.000 /pcs		15.583
- Shock Dart	5 pcs	110.000 /pcs		9.166
- Nail Drill	1 pcs	130.000 /pcs		2.166
- Water tub	1 pcs	150.000 /pcs		2.500
- People services	2 pcs	120.000 /people		4.000
- Netpot	160 pcs	200 /pcs		533
- Aerator	1 pcs	350.000 /pcs		5.833
- Scales	1 pcs	125.000 /pcs		2.083
- TDS Meter	1 pcs	30.000 /pcs		500
- Tray	3 pcs	8.000 /pcs		400
Total			**500.000**	**215.930**

π = TR − TC
= 500.000 – (138.000 + 77.930)
= 500.000 – 215.930
= 284.070

$$R/C\ Ratio = \frac{TR}{TC}$$
$$= \frac{500.000}{215.930}$$
$$= 2{,}32$$

Yields can be analyzed by farming to determine the profit or not from these cultivation activities. Farming can be analyzed using the R/C ratio, which is the calculation between the value of the income earned by the costs incurred to carry out these production activities. Amalia et al. 's opinion (2020), if the value of the R/C ratio is > 1, it means that farming in this cultivation activity can be categorized as profitable and worthy of further development. The capital required for hydroponic cultivation is IDR 215,930 which includes installation costs, water, electricity, TDS meters, trays, scales, and raw materials in the form of rock wool, seeds, and AB Mix fertilizer. Meanwhile, the income earned per installation in one harvest reaches Rp. 500,000 per instalai which is the result of selling 10 kg x Rp.16,000 to collectors and 34 pcs (17 kg) x Rp. 10,000 to the people around BBPP Ketindan, so they get a profit of Rp. 284.070 in each harvest. If seen from the calculation of the value of hydroponic lettuce farming, it is profitable because the R/C ratio reaches 2.32.

Conclusion

Results Observation of the growth of hydroponic lettuce plants from ages 7,14,21,28 and 35 DAP with the parameters of the number of leaves and plant height can be categorized as good. The average number of lettuce leaves at the age of 35 DAP can reach 15.74 leaves, while the average height of lettuce plants at the age of 35 DAP can reach 18.81 cm. Hydroponic lettuce yields in one installation can reach 160 plants with a total weight of up to 27 kg so the average weight per lettuce plant is 168.7 grams. The profit obtained in this hydroponic lettuce business is IDR 284.070, with an R/C ratio value of 2.32, this means that hydroponic lettuce farming is feasible to cultivate.

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