COMPARATIVE STUDY OF HYDROPONIC FARMING INCOME PAKCOY (*Brasisca chinensis* L.) AND Lettuce (*Lactuca sativa* L.)

ABSTRACT

Hydroponics is a technique for cultivating plants, especially vegetables and fruit, without using soil as a planting medium. The increasingly narrow area of productive land, especially in big cities, makes cultivating plants using hydroponic techniques attractive and increasingly important. In hydroponic farming there is also a production income value that is different from the production of the types of vegetables that have been planted. This research aims to determine the income of hydroponic farming and determine the comparison of hydroponic farming. This research was carried out from September 2023 to January 2024. The sampling method was carried out purposive sampling or intentionally, namely at Graha Indah Farm. The data collected is primary data because this hydroponic cultivator built his own business. The results of this research show that the total amount of hydroponic farming income at Graha Indah Farm has different income, for the income value of pakchoy is IDR 38,660,002.53 planting season-1 and IDR 463,920,030.36 year^{-1} or IDR 5,799.00 m-^{2} years^{-1}, while the value of income from lettuce is IDR 16,183,000.83 planting season^{-1} and IDR 194,196,007.59 year^{-1} or IDR 809.15 m^{-2} years^{-1} and pakcoy income is 87.76% while lettuce is 12 .24%. So it can be concluded that the greater income value and demand value is lettuce.

Keywords: Hydroponics, Income, Pakcoy and Lettuce

1. INTRODUCTION

The population continues to increase from time to time resulting in many agricultural land being converted into residential areas, so that efforts to fulfill food needs from the agricultural sector are increasingly challenging. Apart from that, an increase in population will also increase the demand for food. This change in land use occurs on a large scale from agricultural land to residential and industrial land which is difficult to avoid [1]. Land conversion results in increasingly limited agricultural land in urban areas, so it must be handled with an urban farming system [2]. According to the Urban Farm Business Plan Handbook issued by the US Environmental Protection Agency [3] that urban farming is part of the local food system where food is cultivated and produced in urban areas and marketed to consumers in urban areas. the. It was also explained that urban agriculture can take various forms, whether in the form of non-profit gardens or profitable businesses.

Horticultural crops (vegetables and fruit) currently still dominate urban agricultural output, because they are easy to care for, practical and quick to harvest [2]. Apart from that, vegetables have an important role because vegetables are a source of fiber which is very important in meeting the body's nutritional needs to maintain body health.

Limited land is not an obstacle to cultivating vegetables, there are many alternative planting media that can be used to grow vegetables [4]. A vegetable cultivation system using hydroponic techniques is a solution to the challenges of urban farmers. Hydroponic systems can produce higher quality vegetable products continuously compared to conventional farming [5]. Hydroponic technology is a good alternative to obtain good results in terms of quality, quantity and continuity. Hydroponics is a technique for cultivating plants, especially vegetables and fruit, without using soil as a planting medium. The planting media used is rockwool, burnt husks, hiroton, or sand with emphasis on meeting the nutritional needs of plants. Various studies show that hydroponic products have better quality compared to conventional products [6].

Even though it has many advantages, the hydroponic system has its own consequences, namely that it requires special precision and skills and the hydroponic vegetable business requires high costs in production [7].

The production costs required in hydroponic vegetable farming are quite high. Meanwhile, sales of hydroponic vegetables are also greatly influenced by the selling price. Therefore, hydroponic vegetable farming which requires large costs must be able to produce more hydroponic vegetables and the selling price of hydroponic vegetables must be higher than the market price.

Graha Indah Farm is one of the producers of hydroponic vegetables and also one of the pioneers in the development of hydroponic agriculture in Samarinda City. Graha Indah Farm was established in 2012 with a land area of 11 × 8 m2. The hydroponic vegetable cultivation activity is carried out in a greenhouse using a hydroponic installation made of paralon pipes which has 800 planting holes, of which 200 are for lettuce and 600 holes are for bok choy.

The types of vegetables cultivated by Graha Indah Farm are pak choy, lettuce, spinach and mustard greens, with pak choy and lettuce predominating. Judging from the number of enthusiasts and the number of requests, pak choy and lettuce are the types of vegetables that are much in demand. Therefore, pak choy and lettuce vegetables are predominantly cultivated. Many efforts have been made to increase the production of bok choy and lettuce, one of which is that Graha Indah Farm has established partnerships with other hydroponic businesses.

Different types of vegetables, of course, also have differences in the stages and requirements in the cultivation process, production and selling prices. Likewise with various types of hydroponic vegetables cultivated at Graha Indah Farm.

The aim of the research is to determine the costs and income of hydroponic pak choy and lettuce farming and to compare the income of hydroponic pak choy and lettuce farming.

2. RESEARCH METHODS

2.1. Time and place

The research was conducted for three months, starting from November 2022 to January 2023. The research location is Jalan Graha Indah No. 06/08, Air Putih Village, Samarinda Ulu District, Samarinda City, East Kalimantan.

2.2. Method of collecting data

The data collected consisted of: primary data obtained through direct interactions and interviews with hydroponic pak choy and lettuce cultivators using a list of questions that had been prepared in accordance with the research objectives. Secondary data is data needed to support primary data obtained from literature studies through books, the Mulawarman University library, and from scientific works related to research problems.

2.3 Data Analysis Methods

2.3.1. Hydroponic Farming Costs

Farming costs are calculated based on the amount of money actually spent by farmers to finance their farming which includes the costs of production facilities, labor costs and other costs [8]. Farming can be formulated as follows: TC = TFC + TVC

Information: TC = Total Cost/total costs (IDR planting season^{-1}); TFC = Total fixed/fixed costs (IDR planting season^{-1}); and TVC = Total Variable Cost/total variable cost (IDR planting season^{-1})

2.3.2. Acceptance of Hydroponic Farming

Revenue from farming is the total income received by producers or farmers from production activities that have been carried out and have generated money which has not been reduced by costs incurred during production [9]. Mathematically, revenue can be determined using the following formula:

$TR = P \times Q$

Information: TR = Total Revenue/total receipts (IDR planting season^{-1}); P = Price (IDR kg^{-1}), and Q = Quantity (IDR planting season^{-1})

2.3.3. Hydroponic Farming Income

Farming aims to determine the level of income from pakchoy and lettuce farming both from sales of pakchoy and lettuce production with total expenditure in one harvest [10]. To analyze the income from pak choy and lettuce farming, it can be calculated using the formula: I = TR – TC
Information: I = Income/income (IDR); TR = Total Revenue/total receipts (IDR) and TC = Total Cost (IDR)

2.3.4 Comparison of Income Results

Income comparison is a technical analysis of financial reports which is carried out by presenting financial reports horizontally and comparing them with each other, by showing financial information or other data, both in rupiah and in units using the percentage method.

3. RESULTS AND DISCUSSION

3.1. General description of Graha Indah Farm

Graha Indah Farm is one of the suppliers of hydroponic vegetables in the Samarinda area. Graha Indah Farm was founded in 2012 by Mr. Niko Agus Bintoro and his partners. Graha Indah Farm is located on Jalan Graha Indah No. 06/08 Air Putih, Samarinda Ulu District, Samarinda City, East Kalimantan. The beginning of the Graha Indah Farm hydroponic farming business began with Mr. Niko planning to build a hydroponic farming business. The initial crops cultivated were mustard greens, spinach, bok choy and lettuce.

Graha Indah Farm has a total land area of 11 × 8 m2 and its partner land is 20 – 30 m wide and 44 m long, there are 500 pipes and has 800 planting holes, of which 200 are for pak choy planting holes and 600 planting holes are for lettuce. Mr Niko uses the land to develop his hydroponic farming business. Pakcoy is marketed to traditional markets and regular customers, while lettuce is marketed to several restaurants, traditional markets and regular customers.

The level of product demand for hydroponic vegetables at Graha Indah Farm which are more in demand are bok choy and lettuce. Thus, to increase demand capacity, the steps taken are to increase the production of pakchoy and lettuce as well as marketing them to several restaurants and traditional markets. In 2020 - 2021, Graha Indah Farm experienced a fairly high decline in demand due to the Covid-19/Corona virus pandemic, so demand decreased and sometimes there was no production demand at all.

3.2. Use of Pakchoy and Lettuce Production Inputs

In hydroponic farming, production input is very important, because it will affect the products produced. The use of inputs analyzed in this research includes seeds, fertilizers and pesticides.
Table 1. Classification of the use of the total amount of input for hydroponic farming

No	Input Type	Contents per packaging	Number of uses (per planting season)
1.	Seed		
	a.Pakcoy	10 g	15packaging
	b.L e t t u c e	1.000pills	4packaging
2.	Fertilizer		
	a.Nutrition Hydroponic	5 liter	5packaging
3.	Pesticide		

a.Naturo	10 kg	5packaging
b.YellowTrap	10 sheets	1packaging

Source: Primary data (processed) 2023

3.3. Hydroponic Farming Production Costs

Production costs are costs incurred for hydroponic farming activities. Production costs in this research include the costs of purchasing seeds, fertilizer, pesticides, labor wages, equipment depreciation, and other costs. Hydroponic farmers grow plants in one growing season. Details of production costs for hydroponic pak choy and lettuce farming are presented in Table 2.

Table 2. Details of costs for Hydroponic Pakchoy and Lettuce Farming

No	Description	Amount (IDR planting season^{-1})	
		Pakcoy	Lettucea
1.	Costs		
	a. Seeds	1.800.000,00	632.000,00
	b. Fertilizers	210.000,00	105.000,00
	c. Pesticides	220.500,00	110.250,00
	d. Tool Depreciation	1.376.998,74	688.499,37
	e. Other Costs	6.237.500,00	3.118.750,00
	f. Labor	8.325.000,00	4.162.500,00
	Total Production Costs	18.169.998,74	8.816.999,37

Source: Primary data (processed) 2023

Based on Table 2 above, it shows that the total production costs of hydroponic farming include the costs of purchasing seeds, fertilizers and pesticides, labor wages, equipment depreciation costs and other costs. The total production costs for pak choy and lettuce plants for each crop season are IDR 18,169,998.74 and IDR 8,816,999.37, respectively.

3.4. Production and Acceptance of Hydroponic Farming

Based on the data that has been obtained, the area of the hydroponic farming land used is 11 × 8 m2 and the partner land is 20 – 30 m2 wide and 44 m2 long, has 500 pipe units and has 800 planting holes for Pak Choy and lettuce.

Production is the result obtained by farmers for the total results of the entire hydroponic farming business which will then be obtained from the production results of the hydroponic farming business. Revenue is obtained from the amount of production produced multiplied by the price prevailing at the research location, namely for bok choy at IDR 25,000.00 kg^{-1} for lettuce at IDR 25,000.00 kg^{-1}. So the total revenue for hydroponic pakchoy is IDR 56,830,001.27 planting season^{-1} or IDR 681,960,015.18 year^{-1}, while the total revenue for hydroponic lettuce is IDR 25,000,000.00 planting season^{-1} or IDR 300,000,000 .00 year^{-1}.

3.5. Hydroponic Farming Income

Farming income is the result obtained from the difference between revenue and the total production costs that have been incurred during the hydroponic farming production period. Details of receipts and income from hydroponic pak choy and lettuce farming are presented in Table 3.

Table 3. Details of Total Production Costs, Receipts and Income from Hydroponic Pakchoy and Lettuce Farming

No	Description	Amount (IDR Planting Season^{-1})	
		Pakcoy	Lettuce
1.	Total Production Costs	18.169.998,74	8.816.999,37
2.	Revenue	56.830.001,27	25.000.000,00
3.	Income	38.660.002,53	16.183.000,63

Source: Primary data (processed) 2023

Based on the data in Table 3, it shows that the total revenue from pak choy vegetables is IDR 56,830,001.27 planting season^{-1} or IDR 681,960,015.18 year^{-1}, after deducting production costs of IDR 18,169,998.74, the income is IDR 38,660,002.53 per planting season^{-1} or IDR 463,920,030.36 year^{-1} (IDR 5,799.00 m^{-2} year^{-1}). Meanwhile, lettuce plants have a total income of IDR 25,000,000.00 planting season^{-1} or IDR 300,000,000.00 year^{-1}, after deducting production costs of IDR 8,816,999.37, the income is IDR 16,183,000.63 planting season^{-1} or IDR 194,196,007.59 year^{-1} (IDR 809.15 m^{-2} year^{-1}). Thus, there is a difference in the amount of income between pakchoy and lettuce farming. The amount of income obtained is influenced by several factors, namely first, the number of production factors owned and released during the production process. The more production factors used, the greater the income received. Second, the cost of production which also determines the size of the income received by farmers. As a comparative research result reported by {11] that the costs and revenues of pak choy farming in Medan Deli District, North Sumatra are fixed costs IDR 87,472,000.50 and variable costs IDR 272,747,000.00, a total of IDR 360,219,002.50 with an average IDR 12,007,300.08 and pak choy farming is profitable and worth developing. With an R/C value of 1.8. Furthermore, it was reported by [12] that the results of the R/C ratio test analysis on hydroponic lettuce farming obtained an R/C ratio value = 5.05 and earned an income of IDR 8,365,946 in planting season-1. Meanwhile, the non-hydroponic lettuce farming obtained an R/C ratio = 4.33 and earned an income of IDR 3,091,787 in 1 planting season, which means that the hydroponic and non-hydroponic lettuce farming carried out by the respondent was feasible or provided a profit.

4.4. Comparison of Hydroponic Farming Income

Based on research that has been carried out, it is known that the size of the income from hydroponic pak choy and lettuce farming received by farmers is influenced by revenue and production costs. If the number of production requests and selling prices for hydroponic vegetables is higher, the amount of revenue will increase and if the amount of demand decreases, the amount of revenue will decrease causing losses for hydroponic farmers. As stated by [13], there are several factors that can influence the size of the income received by farmers, including: business scale, availability of capital, output price level, availability of labor, transportation facilities and marketing system.

The difference in the amount of income between Pak Choy vegetables and lettuce vegetables is due to differences in the amount of production demand and production selling prices. The selling price for hydroponic pak choy vegetables is IDR 25,000.00 kg-1 with a total income of IDR 38,660,002.53 planting season-^{1} or IDR 463,920,030.36 year^{-1} or IDR 5,799.00 m^{-2} year^{-1}, while lettuce has a selling price of IDR 25,000.00 kg^{-1} with total income of IDR 16,183,000.63 planting season^{-1} or IDR 194,196,007.59 year^{-1} or IDR 809.15 m^{-2} year^{-1} and has an income ratio of pakchoy 87.76% while lettuce 12.24%.

Compared with research conducted by previous researchers in Warukapas Village, Tatelu District, North Minahasa Regency, the amount of income from hydroponic vegetables in one 40-day production period was IDR 7,423,427.05 and the break event point (BEP) value of the S2R Farming

vegetable farming business was IDR 3,388,769 [14]. It can be concluded that the Graha Indah Farm hydroponic farming business has the higher amount of income compared to the income of previous researchers, namely having a total income of IDR 38,660,002.53 planting season^{-1} and IDR 463,920,030.36 year^{-1} or IDR 5,799.00 m^{-2} years^{-1}

4. CONCLUSIONS AND RECOMMENDATIONS

4.1. Conclusion

Based on the results of the research and discussion, the following conclusions can be drawn:

1. For pakchoy plants, the total production cost is IDR 18,169,998.74 mt-1. Revenue was IDR 56,830,001.27 per planting season or IDR 681,960,015.18 year-1, farming income was IDR 38,660,002.53 mt-1 and IDR 463,920,030.36 year-1 or IDR 5,799.00 m -2 years-1.
2. For lettuce plants, the total production cost is IDR 8,816,999.37 mt-1. Revenue is IDR 25,000,000.00 per planting season or IDR 300,000,000.00 year-1 farming income is IDR 16,183,000.63 per planting season and IDR 194,196,007.59 year-1 or IDR 809.15 m-2 year -1.
3. Hydroponic pak choy farming income is greater than lettuce, of the total income obtained 87.76% is income from pak choy plants, the remaining 12.24% comes from lettuce plants.

4.2. Suggestion

Based on the results of the research that has been carried out, the following suggestions can be put forward:

1. Maintenance is carried out with more incentives, in order to increase productivity.
2. In comparing income, it is necessary to increase lettuce production, because the opportunity to increase lettuce is still high.

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