

Production costs and business benefits hydroponics spinach

TB Trisnanto^{1*}, Z Muttaqin², and M Apriyani³

¹Departement of Business and Economic, Politeknik Negeri Lampung, Jl. Soekarno Hatta No. 10 By Pass Rajabasa Bandar Lampung, Indonesia

*Corresponding author: teguhbuditrisonanto@polinela.ac.id

Abstract. Analysis of the cost structure of spinach farming with a hydroponic system needs to be done to determine the costs incurred in this business and how to allocate costs for each activity. Increasing production and income can be done if the costs incurred are known with certainty. The objectives of the research are to analyze costs, revenues, income, R/C ratio, B/C ratio and BEP for spinach farming using hydroponic systems in Bandar Lampung. The analytical methods used were descriptive analysis and quantitative analysis. Methods of data analysis using calculating costs, profit R/C ratio, B/C ratio and BEP. The results showed that the total costs incurred for the production of hydroponic spinach with a land area of 108 m² is IDR 4,000,000. The profit obtained from spinach hydroponic farming is IDR 817,839 per growing season with a BEP value of IDR 3,978 and a selling price of IDR 5,000. Based on the value of R/C and B/C ratio, it can be concluded that spinach hydroponic farming is profitable. This is because the value of $RC > 1$ is 1.26 and the value of $BC > 0$ is 0.26.

1. Introduction

Spinach is a vegetable plant with the scientific name *Amaranthus tricolor* L. Not only is it cheap and easy to obtain, the nutrients contained in spinach are also very high. Spinach has a higher protein, calcium and iron content than lettuce and cabbage. The superiority of spinach's nutritional value, especially in the content of vitamin A (beta-carotene), vitamin C, iron can overcome anemia (lack of blood). In addition, the hydrate content of spinach charcoal is quite high in the form of undigested cellulose fibers. The undigested fiber plays an important role in helping the digestive process by the stomach so that it can prevent all forms of gastric disorders, especially stomach and intestinal cancer. [1](O, 2018).

The demand for spinach in Bandarlampung is quite high. This is closely related to the increasing public awareness of the importance of consuming healthy pesticide-free vegetables. Hydroponic spinach planting time is quite short, namely 21 - 28 days.

The productivity of spinach plants in Bandar Lampung City in 2018 is 7.65 tons / Ha. This amount is much higher than in 2017 which was only 0.89 tonnes / ha. This increase in productivity is supported by the increasing production of hydroponic spinach. Hydroponic spinach production in Bandar Lampung City is suitable because it does not require a large area [2](Badan Pusat Statistik Kota Bandar Lampung, 2019).

The structure of conventional spinach farming costs shows that labor costs contribute a high enough amount, namely 57.54 percent of the total costs incurred. Fertilizer costs amounted to 26.08

percent. Increasing farmer production and income can be done by improving traditional farming systems to a more modern system [3](S, 2014).

Hydroponic systems require a relatively higher investment cost compared to soil media. The relatively high investment costs will be proportional to the benefits obtained. Analysis of the cost structure of spinach farming with a hydroponic system needs to be done to determine the costs incurred in this business and how to allocate costs for each activity. Increased production and income can be done if the costs incurred are known with certainty.

The objectives of the research are to analyze total cost, revenue, income, R/C ratio, B/C ratio and BEP for spinach farming using hydroponic system in Bandar Lampung

2. Materials and Methode

2.1. The method of data collection

The method used in this research is a survey method using a questionnaire. The respondents of this study were hydroponic vegetable entrepreneurs. Sampling was used by stratified random sampling method. The number of respondents who will be sampled is 5 hydroponic entrepreneurs who are scattered in the city of Bandar Lampung..

2.2. The method of data analysis and data processing

The analytical methods used were descriptive analysis and quantitative analysis. Descriptive analysis was used to clearly describe hydroponic spinach farming. The quantitative analysis method is used to analyze the cost, revenue, income and feasibility of spinach farming with a hydroponic system [4](Soekartawi, 2016)

a. Production costs

$$TC = TFC + TVC$$

Information:

TC = Total Cost (IDR)

TFC = Total Fixed Cost (IDR)

TVC = Total Variabel Cost (IDR)

c. Revenue

$$TR = P \times Q$$

Information:

TR = Total Revenue (IDR)

P = Price (IDR)

Q = Production amount (Kg)

c. Benefits

$$\Pi = TR - TC$$

Information:

Π = Benefits bersih (IDR)

TR = Total Revenue (IDR)

TC = Total Cost (IDR)

d. R/C ratio and B/C ratio

$$R/C \text{ ratio} = \frac{\text{Total Revenue}}{\text{Total Cost}}$$

Information:

If $R/C > 1$, the hydroponic spinach farming is profitable

If $R/C = 1$, the hydroponic spinach farming break even

If $R/C < 1$, the hydroponic spinach farming is not profitable (loss)

$$B/C \text{ ratio} = \frac{\text{Total Benefit}}{\text{Total Cost}}$$

Information:

If $B/C > 0$, the hydroponic spinach farming is profitable

If $B/C = 0$, the hydroponic spinach farming break event

If $B/C < 0$, the hydroponic spinach farming is not profitable (loss)

e. BEP (Break Even Point)

A farm is said to be feasible if the BEP unit value is greater than the unit currently being produced and the rupiah BEP value is lower than the current price [4] (Soekartawi, 2016)

$$TR = TC$$

$$P \times Q = TFC + TVC$$

$$Q = \frac{FC + TVC}{P}$$

Information;

TFC = Total fix cost (IDR)

TVC = Total variabel cost (IDR)

TC = Total cost (IDR)

TR = Total revenue (IDR)

P = Price (IDR)

Q = Production amount (Kg)

3. Result and Discussion

Hydroponic spinach can be harvested at the age of 28 days. The number of netpots used in one greenhouse is 2400 which is divided into 6 tables. The total production obtained from 2400 netpots is 800 pcs. Each pcs weighs 250gr which is obtained from 3 netpots. So if you calculate the productivity level per table, the productivity level of hydroponic spinach is 133 pcs / table. Production costs are the total economic costs required in the production of a good. The production costs incurred for spinach hydroponic farming include fixed costs and variable costs. The cost analysis can be explained in detail as follows:

Fix Cost

Fixed costs incurred for spinach hydroponic farming include depreciation costs and land rental costs for the greenhouse. Spinach hydroponic depreciation costs can be seen in Table 3.

Table 3. Spinach hydroponic depreciation costs per growing season

Name of Tools	Amount	Unit	Purchase price	Selling price	UE (Years)	Depreciation	
						Year	Periode
Pipe	384	Meter	80.000	0	10	8.000	614
Netpot	2400	Unit	2.400.000	0	10	240.000	18.411
Jet Pump	1	Unit	600.000	0	15	40.000	3.068
Pipe $\frac{3}{4}$	384	Meter	50.000	0	10	5.000	384
UV Plastic	40	Meter	40.000	0	10	4.000	307
Paranet	1	Roll	450.000	0	10	45.000	3.452
Water Tower	1	Unit	1.600.000	0	15	106.667	8.183
pH meter	2	Unit	80.000	0	10	8.000	614
Green House	1	Unit	18.000.000	150.000	15	1.190.000	91.288
Balance	2	Unit	200.000	0	15	13.333	1.023
Tray	30	Unit	2.500	0	10	250	19
Total Depreciation Cost						127.362	
Total Depreciation Cost/Pcs						159	

Source: Primary data, processed 2020

Spinach hydroponic depreciation costs per growing season can be seen in detail in Table 3. The total depreciation cost per planting season is Rp. 127,362 and the depreciation cost charged to each package is Rp. 159. The land rental cost for a greenhouse is Rp1,150,685, so the total fixed cost for spinach hydroponic farming is the sum of the land rental costs and depreciation costs. The total costs incurred amounted to Rp1,278,047.

Variabel Cost

Variable costs change according to the size of production. If the production quantity increases / increases, the variable cost will also increase by the change in quantity times the variable cost per unit. Variable costs in spinach hydroponic farming consist of seeds, nutrients, electricity, rockwool, plastic packaging and labor costs. The variable costs of spinach hydroponic farming can be seen in Table 2.

Table 2 Hydroponic variable costs of spinach

No	Description	Total Cost
1	Seed	360.000
2	Nutrition	210.000
3	Electricity	100.000
4	Rockwool	398.400
5	Plastic	300.000
6	Labor	535.714
Total variable costs		1.904.114

Source: Primary data, processed 2020

Based on Table 2, it can be seen that the total variable cost is IDR 1,904,114 and details of the seed costs are IDR 360,000, nutrition costs IDR 210,000, electricity costs IDR 100,000, rockwool costs IDR 398,400, plastic costs IDR 300,000 and costs labor of IDR 535,714.

Spinach hydroponic farming analysis can be seen using the revenue to cost ratio (RC) and the profit to cost ratio (BC). Spinach hydroponic farming analysis can be seen in Table 3.

Table 3 Analysis of spinach hydroponic farming per growing season

Production (Pcs)	Price (Rp)	TR (Rp)	TC (Rp)	Benefits (Rp)	BEP	R/C	B/C
800	5.000	4.000.000	3.182.161	817.839	3.978	1,26	0,26

Source: Primary data, processed 2020

Table 3 shows the profits obtained from spinach hydroponic farming of IDR 817,839 per planting season with a BEP value of IDR 3,978 and a selling price of IDR 5,000. Based on the value of R / C and B / C ratio, it can be concluded that spinach hydroponic farming is profitable. This is because the value of $RC > 1$ is 1.26 and the value of $BC > 0$ is 0.26. The criteria for the results of the R / C ratio and the B / C ratio are:

R / C > 1 and B / C > 0 means that the business has been run efficiently or profitably

R / C < 1 and B / C < 0 means the business is not run efficiently

R / C = 1 and B / C = 0 means that the business is carried out at the break event point (BEP).

The R / C and B / C values of the ratio indicate that each additional cost or expense of Rp1 will result in an income of Rp1.26 and will result in a profit of Rp0.26. This shows that spinach hydroponic farming in the short term has a profitable business return.

4. Conclusions

The profit obtained from hydroponic spinach farming is IDR 817,839 per growing season with a BEP value of IDR 3,978 and a selling price of IDR 5,000. Based on the value of R / C and B / C ratio, it can be concluded that spinach hydroponic farming is profitable. This is because the value of $RC > 1$ is 1.26 and the value of $BC > 0$ is 0.26.

5. References

- [1] Agustin O 2018 The Effect Of Hydroponic Planting Media On Spinach Growth Red (Amaranthus Tricolor L.) Palembang Thesis
- [2] Badan Pusat Statistik Kota Bandar Lampung 2019 Bandar Lampung In Figures 2019 www.bps.go.id.
- [3] Dharma S 2014 Spinach Farming Analysis Wahana Inovasi 3: 73–83
- [4] Soekartawi 2016 Farming Analysis Universitas Indonesia Jakarta 110
- [5] Utami H 2018 Analysis of Tofu Business Performance. Home Industry Case Study Tofu in East Bara-Baraya Village Makassar District Makassar Universitas Hasanuddin Makassar