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Feasibility Analysis and Break Even Point Celery Farming (*Apium graveolens* L.) Hydroponic Deep Flow Technique (DFT) System

(Case Study on a Farmer in Kayuambon Village, Lembang District, West Bandung Regency)

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Abstract

Medicinal properties. The celery plant also contains many apiin glycosides (flavone glycosides, isoquercetin, and umbelliferons. It also contains, mannite, inocytes, asparagine, glutamine, choline, linamarose, pro vitamin A, vitamin C, and B. This study aims to determine the cost, R/C *Ratio*, break-even point (BEP) of celery hydroponic farming system with deep flow technique (DFT). The analysis method used in this study is quantitative analysis by calculating and detailing the analysis of costs, income and receipts, feasibility, and break-even points. The results showed that the cost of the hydroponic agricultural system was IDR 2,213,720.6. The R/C *Ratio* is 1.01, so the agricultural system is feasible. The break-even point (BEP) for receipts amounted to IDR 2,160,006.45 while real receipts amounted to IDR 2,224,800. This means that this agricultural system still benefits IDR 64,733.55. The break-even point for production is 184.48 Kg, while the actual production is 185.4 Kg. This means that production provides a benefit of 0.92 Kg. Break-even point selling price is IDR 11,940.24/Kg while the actual selling price is IDR 12,000/Kg. This agricultural system provides benefits of IDR 60/Kg.

Keywords: Break Even Point, Celery Farming System, DFT Hydroponic System, Feasibility.

1. Introduction

The celery plant (*Apium graveolens* L.) belongs to the commodity class of leaf vegetables and has export value. The plant is the second important plant of the type of spice plant after lettuce in terms of its popularity and value. Celery is therefore considered a dietary food and is always available throughout the year (Skypala, 2019). Celery production in Indonesia is constrained by the limited area of productive land so that the right choice of technology to overcome this problem is the hydroponic technology of the Deep Flow Technique (DFT) system. Vegetables produced using hydroponic technology are of better quality compared to conventional vegetables.

The advantages of hydroponics of this DFT system are that plant growth is faster, more uniform, and if the electricity fails, plants can still survive with the presence of residual water in the installation. Hydroponic vegetable cultivation is a farming business with technology that is aggressive to change / innovation that can provide relatively large profits (Sharma et al., 2018).

As a technology, celery farming business hydroponic system Deep Flow Technique (DFT) needs to be studied regarding the feasibility of farming and break even points so that it becomes a consideration for farmers to implement.

2. Literature Review

Costs are sacrifices of economic sources measured in units of money, which have occurred or are likely to occur for a specific purpose (Drury, 2013). Types of costs have three types, namely fixed costs *(fixed c ost*, variable *costs (variable costs),* semi-variable costs *(semi-variable costs)* (Sinambela & Djaelani, 2022). Receipts are all income earned during one period that is taken into account from the results of sales or re-estimation. Revenue can be obtained from the multiplication between the amount of production and the selling price (Stinner, 2007).

Revenue is an increase or increase in assets that are a result of operating activities or procurement of goods and services to consumers. Income is one of the most important elements of the formation of an income statement. Income greatly affects the continuity of a business, the greater the income obtained, the greater the ability of the business to finance all expenses or operating costs that will be carried out (Wild, 2007). R/C *Ratio* is an analysis to determine the level of efficiency of farming. This analysis can be calculated from the comparison between the amount of receipts and the amount of fees used for the management of farming (Stinner, 2007).

Break *Even Point* (*BEP*) is a state when the result obtained is equal to the capital spent or called the break-even point. The function of the *BEP* analysis is to find out when the business does not make a profit and also does not experience losses (a turning point in capital) (Barnard et al., 2020).

2. Materials and Methods

2.1. Materials

In this study, the data used were primary data in the June – August growing season which included data on production costs, receipts, income, R/C, and break even points. The source of the data is a farmer who has carried out training on hydroponic celery farming in the Deep Flow Technique (DFT) system in Kayuambon Village, Lembang District, West Bandung Regency.

2.2. Methods

In this study the authors used a type of quantitative descriptive research, because the data obtained will be in the form of numbers. The numbers obtained will be further analyzed in data analysis. And there are data sources that are used:

a) Primary data is data obtained by themselves from observations that have been made directly at the research location as well as from the results of interviews with respondents.
b) Secondary data is data obtained or collected from various sources or certain parties and agencies.

The data collection techniques to be used in the research are: a) Observation b) Interview c) Questionnaire.

2.3. Formula / Equation

Formula used to calculate costs, revenues and R/C.

(1) Cost Analysis (Stinner, 2007).

TC = TFC + TVC

Where:

TC = *Total Cost*

TFC = *Total Fixed* Cost (Total Fixed Cost) TVC = *Total Variable Cost*

(2) *Revenue Analysis* (Stinner, 2007).

TR = Py . Y

Where:

TR = *Total Revenue* Py = *Price* (Product price)

Y = Number of productions

(3) *Income Analysis* (Stinner, 2007).

I = TR – TC

Where:

I = *Income*

TR = *Total Revenue*

TC = *Total Cost*

(4) *R/C analysis* (Stinner, 2007).

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

With the following conditions:

a) R/C is greater than 1, so the farming business is profitable.
b) R/C is equal to 1, so the farming business does not profit and not lose (breakeven).
c) R/C is less than 1 then the farming business is at a loss

(5) *Break-even Point of Sale* (Barnard et al., 2020).

$$\text{Break-even Point of Sale} = \frac{TfC}{y\ 1 - (\text{TVC/TR})}$$

(6) *BEP of Selling Price* (Barnard et al., 2020).

$$\text{BEP of Selling Price} = \frac{TC}{y}$$

(7) *BEP Production Volume* (Barnard et al., 2020).

$$\text{BEP Production Volume} = \frac{TC}{py}$$

Where:

TR = *Total Revenue*
Py = *Price* (Product price)
Y = Production Quantity
TC = *Total Cost*
TFC = *Total Fixed Cost*
TVC = *Total Variable Cost*

3. Results and Discussion

3.1. Total Fixed Cost (TFC)

$$\text{Land rental fee} = \frac{\text{Land area}}{\text{1 hectare}} \text{ X Rental Price X Growing Season}$$
$$= \frac{50 \text{ m}^2}{10{,}000 \text{ m}^2} \text{ X } 20{,}000{,}000 \text{ x } (2/12)$$
$$= \text{IDR } 16{,}666.6 \text{ per growing season}$$

Table 1: Depreciation Costs of Building Investment, DFT Installations, and Equipment

Item Type	Amount (Unit)	Unit Price (IDR/unit)	Buy Value (IDR)	JUE (Year)	Depreciation / season (IDR)
Building	50 m^2	200,000	10,000,000	15	100,000
DFT Installation	50 m^2	250,000	12,500,000	5	375,000
Machine	1 Pcs	900,000	900,000	5	27,000
Drum	2 Pcs	150,000	300,000	5	9,000
Toren Tank 1550 L	1 Pcs	3,080,000	3,080,000	5	92,400
Netpot	1717 Pcs	400	686,800	5	20,604
Cable	8 Meters	9,500	76,000	5	2,280
Terminal	1 Pcs	15,000	15,000	5	450
TDS &EC Meter	1 Pcs	30,000	30,000	5	900
Ph Meter	1 Pcs	44,000	44,000	5	1,320
Handsprayer	1 Pcs	800,000	800,000	5	24,000
		Total			**652,954**

Total Fixed Cost (TFC) = Land Rental Fee + Depreciation Cost Investment in buildings, DFT installations and Equipment
= IDR 16,666.6 + IDR 652,954
= IDR 669,620.6

3.2. Total Variable Costs

Table 2: Cost of Celery Production Facilities

No.	Variable Costs	Amount	Unit Price (IDR/unit)	Amount (IDR)
1.	Celery Seeds	1 Pack	40,000	40,000
2.	Ab *Mix* Nutrition	3 Kg	70,000	210,000
3.	*Flannel*	3 Meters	22,600	67,800
4.	Rockwool	2 Sheets	67,800	135,600
5.	Syklon	1 Pcs	38,000	38,000
6.	Anthracol	1 Pcs	40,500	40,500
7.	Trident	1 Bottle	43,000	43,000
8.	Electricity	2 Months	100,000	200,000
		Total		**774,100**

Table 3: Length of Working Time

No.	Type of Work	Period (days)	Man's Weekday (MWD)	Length of Work (Hours)
1.	Hydroponic *Screen* Preparation	1	1	5
2.	Hydroponic Installation Preparation	2	1	5
3.	Planting Media Preparation	1	1	5
4.	Planting	1	1	5
5.	Embroidery	2	1	1
6.	Disambiguation	10	1	2
7.	Sanitation	4	1	2
8.	Disease Pest Control	12	1	1
9.	Harvesting	1	2	5

Table 4: Labor Wages

No.	Activities	Many Workers	Amount (IDR)
1.	Hydroponic *Screen* Preparation	1 Day x $\frac{5}{5}$1 MWD x70,000	70,000
2.	Hydroponic Installation Preparation	2 Days x 1 MWD x70,000$\frac{5}{5}$	140,000
3.	Planting Media Preparation	1 Day x 1 MWD x70,000$\frac{5}{5}$	70,000
4.	Planting	1 Day x 1 MWD x70,000 $\frac{5}{5}$	70,000
5.	Embroidery	2 times x 1 MWD x70,000$\frac{1}{5}$	28,000
6.	Disambiguation	10 times x 1 MWD x70,000$\frac{1}{5}$	140,000
7.	Sanitation	4 times x 1 MWD x 70,000$\frac{1}{5}$	56,000
8.	Disease Pest Control	12 Days x 1 MWD x70,000$\frac{1}{5}$	168,000
9.	Harvesting	1 Day x 2 MWD x 70,000$\frac{1}{5}$	28,000
	Total		**770,000**

3.3. Total Cost (TC)

Total Cost (TC) = Total Fixed Costs + Total Variable Costs
= 669,620.6 + 1,544,100
= IDR 2,213,720.6

3.4. Revenue

Number of plants = 1,717
Risk of failure = 10%
= 1717 x 10 %
=172 Plants
weight per plant = 120 gr or 0.120 Kg
price per Kg = IDR 12,000
Number of Plants – 10% Risk of Failure
= 1,717 – 172
= 1,545 Plants
Number of plants x weight per plant
= 1,545 x 120 gr
= 185,400 Grams
= 185.4 Kg

Total Revenue = Number of plants x Selling price per Kg
= 185.4 Kg x IDR 12,000
= IDR 2,224,800

3.5. Income

Income = Total Receipts – Total Cost
= IDR 2,224,800 – IDR 2,213,720.6
= IDR 11,079.4

3.6. The Concept of Business Feasibility (R/C Ratio)

$$\textbf{R/C } \textbf{\textit{Ratio}} = \frac{Total\ Revenue}{Total\ Cost}$$

$$= \frac{2,224,800}{2,213,720.6} = \mathbf{1.01}$$

The R/C *ratio* of celery farming has a value = 1.01 in the sense that from every cost of IDR 1 spent in the receipt of IDR 1.01 and a profit of 0.01 is obtained so that thus the celery farming business is profitable and worthy of business.

3.7. Break Even Point (BEP)

$$\text{Break-even Point of Sale} = \frac{FC}{1 - \frac{VC}{R}}$$

$$= \frac{669,620.6}{1 - \frac{1,544,100}{2,224,800}}$$

$$= \frac{669,620.6}{1 - 0.69}$$

$$= \text{IDR } 2,160,066.45$$

Break-even Point of Sale IDR 2,160,066.45 this means that when farmers get revenue of IDR 2,160,066.45 then farmers do not experience profits and do not experience losses (Breakeven). Meanwhile, the current revenue of IDR. 2,224,800 is already profitable even though the value is small.

$$\text{BEP Production volume} = \frac{TC}{Py}$$

$$= \frac{2,213,720.6}{12,000}$$

$$= 184.48 \text{ Kilograms}$$

BEP production volume is 184.48 kilograms, this means that when farmers produce 184.48 kilograms of products, farmers do not experience profits and do not experience losses (Breakeven). Meanwhile, the current production of 185.4 kilograms has provided a profit even though the value is small.

$$\text{BEP of Selling Price} = \frac{TC}{Y}$$

$$= \frac{2,213,720.6}{185.4}$$

$$= \text{IDR } 11,940.24$$

BEP of Selling Price is IDR 11,940.24 / kilogram, this means that when farmers sell celery for IDR 11,940.24 / kilogram, this means that when farmers sell celery for IDR 11,940.24 / kilogram, then the farmer does not experience a profit and does not experience losses (Breakeven). While the current product price of IDR 12,000 / kilogram already provides an advantage even though the value is small.

4. Conclusions

The conclusions that can be drawn from the analysis of hydroponic celery farming of the DFT system in Kayuambon Village, on a land area of 50 m^2 and a population of 1,717 plants in one growing season are as follows:

1) The amount of celery farming costs is IDR 2,213,720.6 consisting of variable costs of IDR 1,544,100 and fixed costs of IDR 669,620.6.
2) The amount of R/C Ratio is 1.01, this means that from each cost of IDR 1, revenue of IDR 1.01 and income of 0.01 are obtained. Thus the celery farming business is profitable.
3) BEP value:
   a) Break-even Point of Sale IDR 2,160,066.45 this means that when farmers get receipts of IDR 2,160,066.45 then farmers do not experience profits and do not experience losses (Breakeven). Meanwhile, the current revenue of IDR 2,224,800 has provided benefits even though the value is small.
   b) BEP Production volume is 184.48 kilograms, this means that when farmers produce production of 184.48 kilograms, farmers do not experience profits and do not experience losses (Breakeven). Meanwhile, the current production of 185.4kilograms has provided a profit even though it is of small value.
   c) BEP of Selling Price is IDR. 11, 940.24 / kilogram, this means that when farmers sell celery for IDR 11,940.24 / kilogram, this means that when farmers sell celery for IDR 11,940.24/kilogram, then the farmer, did not experience any profit and did not suffer a loss (Breakeven). While the current product price of IDR. 12,000 / kilogram has provided an advantage even though the value is small.

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