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Feasibility Analysis of Organic Pakcoy Agriculture Usinghydroponic Systems in the Covid-19 Pandemic in Batu City

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Abstract:
Pakcoy mustard (Brassica rapa. L) is a vegetable plant belonging to the Brassicaceae family. Pakcoy mustard plants are still closely related to mustard greens. Recently, hydroponic technology has emerged which has attracted attention as an innovation to increase foodsecurity as well as a solution for farming on limited land and without using soil media. The research objective is to determine. The research objective was to determine the feasibility of Pakcoy mustard farming with a hydroponic system during the Covid-19 pandemic in garden plots. The research was conducted at the Beji Makmur Gapoktan Farm, Beji Village, Junrejo District, Batu City. The farming analysis that will be used is income analysis (π), business ratio (R/C), and Break Even Point (BEP). The results of the feasibility analysis of hydroponic mustard pakcoyfarming during the Covid-19 pandemic were found to be profitable because the R/C value> 1, namely 1.57, this indicated that the farming was profitable with an income of the hydroponic mustard pakchoy farming demonstration plot of Rp. 2,875,000. To achieve a break-even point(BEP) to obtain a minimum gross revenue of IDR 815,738, this means that the mustard greensfarming hydroponically duringthe Covid-19 pandemic is feasible.

***Key Word**: Business Feasibility, Hydroponics, Mustard Greens*

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I. Introduction

The pakcoy mustard plant still has a close relative to the mustard greens, its appearance is very similar to the mustard greens, but it is shorter and compact, the leaf stalks are wide and stu[illegible], the leaf bones are similar to mustard greens, the leaves are thicker than mustard greens. Pakcoy mustard (Brassica rapa L.) is a type of vegetable plant that belongs to the Brassicaceae family. Pakcoy mustard plants when viewed from the economic and business aspects are feasible to be developed or cultivated to meet consumer demand which is getting higher and higher and there are market opportunities. The feasibility of developing mustard pakcoy cultivation is shown, among other things, by the comparative advantage of the conditions in the tropical region of Indonesia which are very suitable for this commodity, in addition, the harvesting age of mustard pakcoy is relatively short, namely 40-50 days after planting and the results provide adequate profits (Efendi, Mawarni, 2017). According to Tri and Nano (2016), mustard greens, besides being a vegetable, can also be beneficial to human health, especially those who consume it regularly. Pakcoy can relieve itching in the throat in cough sufferers, cure headaches because it contains vitamins and nutrients that are important for human health. Fertilization has an essential role in the success of plant cultivation. Plants need appropriate fertilizer to meet nutrient needs so they can grow and develop properly. Provision of organic fertilizers can increase reserves with nutrients in the soil, improve soil structure and increase soil organic matter content.

Judging from the average vegetable production in Indonesia, it is still relatively low, namely 20 tons/ha, compared to countries in China at 40 tons/ha, the Philippines at 25tons/ha, and Taiwan at 30 tons/ha. Based on data from the Central Bureau of Statistics (BPS) for North Sumatra Province, in 2017 the production of pakcoy vegetables decreased from 76,367 tons in 2015 to 64,820 tons in 2016. This decrease in production was followed by a reduction in the area of harvested land from 6,415 ha in 2015 to 5,383 ha in 2016. In the end,it impacts decreasingthe productivity of pakcoy plants due to shrinking agricultural land.

The problem of providing national agricultural land between national rice fields reaches 100 thousand hectares every year. Agricultural land which has decreased in the area due to increased industry and housing has caused farmers to compete to replace the land used for cultivating plants to switch to the hydroponic method. Hydroponics is an alternative that can be used to increase plant productivity, especially on a narrow land.

According to Nazaruddin (1998), advances in agricultural technology make it possible to hide vegetables out of season. For this reason, greenhouses are used and are generally carried out with a hydroponic system, so that the needs of vegetables can be met and their continuity can be maintained. Hydroponics is a term used to explain how to grow crops without using soil as a safe planting medium (Lingga, 2002). According to Suhardiyanto (2002), the advantages of hydroponics compared to drying in soil media include cleanliness that is easier to maintain,no serious problems such as tillage and weeds, the use of fertilizers and water is veryefficiently, plants can be cultivated continuously regardless of the season, plants produce withhigh quality, higher crop productivity, plants are easier to select and control properly and can be cultivated on a narrow land, free from the use of inorganic pesticides. The use of inorganic pesticides can contaminate plant tissue which will also affect consumers. With the many advantages of hydroponic technology as well as the community's need for vegetable commodities which continues to increase, there are business opportunities in agriculture with hydroponic systems that have promising prospects. The hydroponic system is divided into three namely hydroponic substrates, NFT (Nutrient Film Technique), and aeroponics. But the most developed substrate and NFT hydroponic systems. In its development, it is not only for asmall scale but already covers a large or commercial scale, as has been developed at GapoktanBeji Makmur.

II. Material And Methods

This research was carried out at the Gapoktan Beji Makmur, Beji Village, Junrejo District, Batu City, this determination was based on the consideration that BejiMakmur Gapoktan is one of the Gapoktan that cultivates hydroponic plants. The research object under study is the financial feasibility of organic pakcoy mustard farming with a hydroponic system during the Covid-19 pandemic. The sample in this study were members ofthe Beji Makmur Gapoktan who manage the hydroponic garden, namely 3 people.

The research uses quantitative design techniques to analyze the feasibility of hydroponic pakcoy mustard farming to see whether a business can provide benefits to the company, as well as see the value of a particular activity carried out and whether it is feasible or not (Umar 2003). Therefore, to determine the feasibility of pakcoy mustard farming using hydroponic techniques during the Covid-19 pandemic in Beji Makmur Village, Junrejo District, Batu City, a simple analysis was used, namely income, business ratio, and Break Event Point (BEP).

Revenue Analysis

Income analysis is used to find out all input and output variables used by a business and how much profit will be obtained from farming conducted by Soekartawi (2006). The following is the income formula for pakcoy mustard farming using hydroponic techniques during the Covid-19 pandemic:

$\pi = TR - TC$ (1)

Information:

π = Benefits of hydroponic pakcoy mustard farming

TR = Total income of hydroponic pakcoy mustard farmingTC = Totalcost of hydroponic pakcoy mustard farming

Revenue Cost Ratio (R/C) Analysis

Business ratio analysis is an analysis used to calculate whether a farming operation is feasible or not. The formula for the profit ratio R/C of hydroponic pakcoy mustard farmingcan be seen in the formula below:

R/C Ratio = TR / TC (2)

Information:

TR = Total revenue of hydroponic pakcoy mustard farmingTC = Total cost of hydroponic pakcoy mustard farming Business Criteria:

R/C > 1, Pakcoy hydroponic mustard farming is feasible R/C = 1, Pakcoy hydroponic mustard farming broke even R/C < 1, Pakcoy hydroponic mustard farming is not feasible**Break-Even Point Analysis (BEP)**

Break Even Point is an analysis tool that is used to see how much the minimumproduction capacity of the farming business is carried out so that the investment does not experience losses but also does not generate profits. The equation of the BEP can be seen inthe equation below:

BEP Gain = TFC / (1- (TVC/TR).....(3)

TFC = Total fixed costs of hydroponic pakcoy mustard farming TVC = Total variable cost of hydroponic pakcoy mustard farmingTR = Net income from hydroponic pokcay mustard farming.

III. Result Income Analysis of Sawi Pakcoy Farming Hydroponic System

The cost of farming the mustard greens pakcoy system consists of two types of costs, namely fixed costs (Total Fixed Cost/TFC) and variable costs (Total Variable Cost/TVC). These costs are then added up to become the Total Cost (Total Cost/TC). Revenue in the mustard pakcoy hydroponic farming business is the total income received by Gapoktan from production activities that have been carried out which have generated money that has not been deducted from the costs incurred during production. Revenue (Total Revenue/TR) is the multiplication of the selling price (p) and the number of units of mustard pakcoy harvested(q). After that, finding profit (Profit / π) can be done by subtracting revenue (Total Revenue / TR) from Total Cost (Total Cost / TC). Based on the calculations that have been carried outby the researchers, the results of the analysis of costs, revenues, and profits can be seen in the description below.

Table 1.
Income Analysis of Hydroponic Sawi Pakchoy Farming at Gapoktan Beji Makmur OneGrowing Season

No	Description	Price (Rp)	Volume (Kg)	Amount (Rp)
1.	Acceptance of Pakchoy Sawi	25,000	115	2.875.000
	Total Revenue (TR)			2.875.000
2	Farming Costs			
	a. Fixed Cost (TFC)			
	- Tool Shrinkage			423.833
	- Land Tax			16.666
	- Electricity			200.000
	b. Variable Cost (TVC)			
	- AB mix nutrition			
	- Seeds			130.000
	- Labor (HOK)			76.000
	- Foam/Rockwool			900.000
	- Plastic packaging			175.00
				39.000
	Total Cost (TC)			1.832.000
	Income π = TR-TC			1.043.000

IV. Discussion

Fixed costs / TFC, namely costs calculated from the cost of depreciation of equipment and land taxes. The cost of depreciation of tools in the cultivation of the pakcoy mustard hydroponic system includes; Greenhouse rental costs, hydroponic nutrient tanks, styrofoam, hydroponic flannels, net pots, and trays. Based on the calculation data, the total fixed costs areIDR 440,499 per planting season.

Variable costs / TVC in the cultivation of the pakcoy mustard hydroponic system consist of tools and materials that are used up for 1 production, including pakcoy mustard seeds, Rockwool, AB mix nutrition, labor, and hydroponic vegetable plastic packaging. Total Variable Cost of Rp. 1.320.000,- per growing season. Based on the description above, it canbe concluded that the total cost/TC of the Pak Choy mustard hydroponic farming system is 1,832,000.-.

Revenue (TR) in the cultivation of the Pakchoy mustard hydroponic system wasobtained from the amount of Packcoy mustard harvested per planting season, which was 115 kg multiplied by the average price prevailing during the pakcoy mustard harvest season, namely Rp. 25.000,- per kg. Total Revenue obtained as much as Rp. 2,875,000,- per planting season.

Based on the calculation of BEP receipts, the results obtained are Rp. 815,738, - whichmeans that the Pakcoy mustard hydroponic farming will reach the BEP point if the income from the Pakcoy mustard harvest is higher than the Revenue BEP. while the hydroponic mustard greens farming business in this study, Packcoy, has a revenue calculation of Rp. 2,875,000,-, which is higher than the revenue BEP.

Feasibility analysis can also be calculated using the R/C ratio, and based on calculations in this study, the R/C ratio obtained is 1.57, which means that Pakcoy hydroponicfarming is feasible to continue. Suratiyah, 2008 states that if the results of the calculation of the R/C Ratio > 1, the revenue received is greater than the costs incurred, meaning that the business is feasible to continue. Revenue is greater than the costs incurred, the revenue obtained is high because farmers can produce good quality products so that the selling price isgood. Packcoy harvesting rate by farmers is relatively fast, with a planting period of 35-40 days. (Suratiyah, 2008).

V. Conclusion

The conclusions from the results of this study are as follows:

1. The average total cost /TC is IDR 1,832,000 for every time Packcoy mustard isproduced. The average Total Revenue / TR of hydroponic pakcoy mustard cultivation is Rp. 2,875,000, - so it can be concluded that the profit obtained by Gapoktan Beji Makmur from the results of hydroponic mustard greens farming in each production is as much as Rp. 1,043,000,-.
2. The R/C ratio analysis yielded a result of 1.57 which can be concluded that the Pakcoymustard hydroponic farming is feasible to continue.
3. Revenue BEP analysis, that is, more acceptance of mustard pakcoy farming is greater than BEP Acceptance so it can be concluded that hydroponic mustard pakcoy farming is feasible.

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