

Business Feasibility of Pagoda Mustard (*Brassica Narinosa*) with Hydroponic Wick System Model

Nurul Risti Mutiarasari^{1*}, Yogi Nirwanto²
Universitas Siliwangi, Tasikmalaya

Corresponding Author: Nurul Risti Mutiarasari nurulristim@unsil.ac.id

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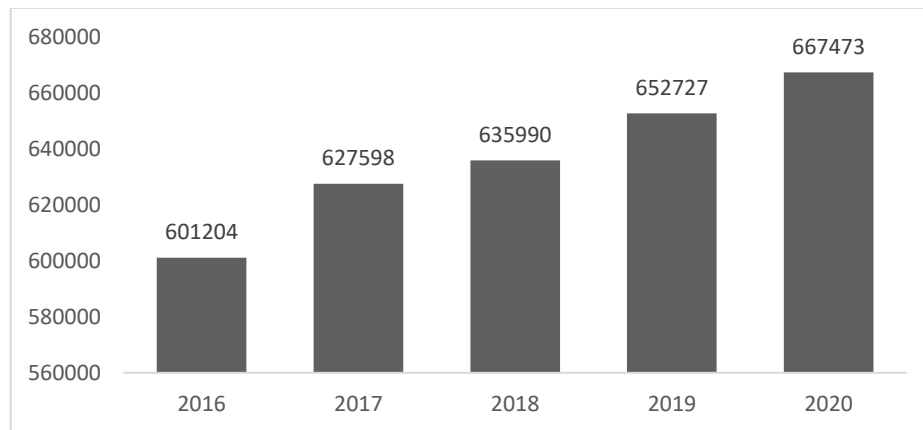


ABSTRACT

The potential and business opportunities of pagoda mustard commodities can be said to be very open, but technical and financial information about production is still very limited. Pagoda mustard greens are one type of mustard greens that contain many nutrients and antioxidants that function as cancer preventers. The purpose of this research is to provide an overview of the business of pagoda mustard commodities, especially with the hydroponic wick system cultivation system. The research method used in this study is the calculation of production costs, revenue, income, and feasibility. The research was conducted in a green house in Tamansari District, Tasikmalaya. The results showed that with the green house land area used was 40 m², the production cost was IDR 2,127,986 with total revenue generated of IDR 4,928.95, so that the total income earned was IDR 2,800,000. The feasibility level obtained in pagoda mustard cultivation with hydroponic wick system is 2.31, indicating that it is feasible

INTRODUCTION

The agricultural sector is one of the sectors whose sustainability and availability need to be considered because it is closely related to the fulfillment of community food, one of which is in horticultural crops, namely vegetables. Vegetables are a horticultural product that is in great demand by the community, this is in line with the increase in population and changes in healthy lifestyle trends, resulting in an increase in community vegetable consumption.



Source : Statistics Indonesia (2020)

Figure 1 Vegetable Production in Indonesia 2016-2020 (ton/hectare)

Based on Figure 1, it shows that vegetable production in Indonesia has increased every year, this is driven by the large demand and increase in overall public consumption of vegetables. Increased public consumption is an opportunity to be able to produce more diverse types of vegetables by paying attention to the quality of the products produced. Mustard is one type of vegetable that is very popular and much favored by people in Indonesia. There are several types of mustard varieties, one of which is pagoda mustard (*Brassica narinosa*) or also known by other names *Ta Ke Chai* and *Tatsoi*. Pagoda mustard is a type of mustard that contains many nutrients and antioxidants that function as cancer preventers, so when consumed it will have a very good effect on maintaining a healthy body. The content of nutrients in pagoda mustard greens such as calcium, folic acid and magnesium can also support bone health (Zatnika, 2010). However, this type of mustard is still very rarely found in the market, although there are some farmers who have started cultivating it, but the production and distribution are not as much as other types of mustard. Though pagoda mustard has the potential to be developed in Indonesia, because when viewed from climatological aspects, technical aspects, economic aspects, and social aspects are very supportive (Larkcom, 2007). Technically, efforts to achieve increased production can be done in agricultural intensification and extensification. Intensification efforts are not only aimed at increasing the quantity of products, but also at improving the quality of pagoda mustard yields. In addition, the availability of nutrients for plants through fertilization is an effort that can be made to meet plant nutrient needs. Fertilizer is a material that functions to provide essential elements for plants for their growth and

development in plants. Providing fertilizer to plants must pay attention to the status of nutrients in the soil and also the amount of nutrients needed by plants. Plant fertilizers are usually applied to the soil, but can also be given through the leaves or stems as a solution. Fertilization of plants can be done with inorganic fertilizers or organic fertilizers (Simanullang, et al, 2019).

One of the efforts to make fertilization more efficient and improve the quality of pagoda mustard plants is by using hydroponic cultivation. Hydroponics is known as soil-less plant cultivation, which is a farming technique that emphasizes meeting the nutritional needs of plants (Setyoadji, 2015). Hydroponics is one of the popular plant cultivation systems in the community, especially in urban areas, because it does not require a large area of land, so it can be done in the yard (Hamli, et al., 2015). In addition, hydroponics is one of the agricultural systems of the future because it can be cultivated in various places, whether in villages, in cities, on open land, or even on top of buildings. In addition, hydroponic systems can overcome problems regarding narrow land area, critical soil conditions, uncontrollable pests and diseases, limited amount of irrigation water, uncertain seasons, and non-uniform quality (Hartus, 2008).

The potential and business opportunities of pagoda mustard commodity can be said to be very open, but technical and financial information on production is still very limited. In addition, the use of fertilizers and cropping systems can affect the economic aspects of the business. To support the successful development of the pagoda mustard commodity business, in addition to the technical aspects, it is also necessary to conduct a financial analysis of the pagoda mustard commodity business on inorganic fertilizer treatment with a hydroponic wick system model as an illustration of the business potential of pagoda mustard commodities.

THEORETICAL REVIEW

Mustard Pagoda

According to Margiyanto (2007) classification in plant systematics, pagoda mustard greens are included in:

Kingdom	: Plantae
Subkingdom	: Tracheobionta
Super Division	: Spermatophyta
Division	: Magnoliophyta
Class	: Magnoliopsida
Sub Class	: Dilleniidae
Ordo	: Capparales
Family	: Brassicaceae
Genus	: Brassica
Species	: Brassica narinosa L.

Pagoda mustard (*Brassica narinosa*) is one type of mustard that contains many nutrients and antioxidants that function as cancer preventers so that when consumed it is very good for maintaining a healthy body. The content of nutrients in pagoda mustard greens such as calcium, folic acid and magnesium can also support bone health (Zatnika, 2010). Pagoda mustard greens are rarely

found in the market because in addition to the higher price, the vegetable cultivation system in Indonesia is generally still conventional, which results in less than optimal yield and quality of mustard greens. Efforts to increase productivity and improve the quality of conventional vegetables have been made by many farmers but the results are not satisfied (Nugraha, 2015).

Hydroponic Wick System

Hydroponics is a way of cultivating plants using water that has been dissolved with nutrients needed by plants as a growing medium to replace soil. The concentration of the nutrient solution must be maintained at a certain level for optimal plant growth and production (Istiqomah, 2006). Hydroponics can be an alternative to limited agricultural land and can be practiced on land with low fertility or in densely populated areas. Commodities that can be selected in hydroponic cultivation such as endive, green curly lettuce, red curly lettuce, lollo rossa, butterhead, christine, packcoy, monde and Romain lettuce are rarely cultivated by conventional farmers (Herwibowo and Budiana, 2014).

One hydroponic method that is often used is the wick system, also known as the capillarity wick system (CWS), which is a watering system that utilizes the principle of capillarity. Hydroponics is a way of cultivating plants using water that has been dissolved with nutrients needed by plants as a growing medium to replace soil. The concentration of the nutrient solution must be maintained at a certain level for optimal plant growth and production (Istiqomah, 2006). Hydroponics can be an alternative to limited agricultural land and can be practiced on land with low fertility or in densely populated areas. Commodities that can be selected in hydroponic cultivation such as endive, green curly lettuce, red curly lettuce, lollo rossa, butterhead, christine, packcoy, monde and Romain lettuce are rarely cultivated by conventional farmers (Herwibowo and Budiana, 2014).

This cultivation technique has many advantages compared to conventional methods on the ground, namely cleaner plant yields, nutrients used are more efficient because they are in accordance with the needs of plants, plants are free of weeds, plants are relatively rarely attacked by pests and diseases because they are controlled, the quality and quantity of production is higher so that it has a high selling value, and can use narrow land (Said, 2007). Hydroponic cultivation is more environmentally friendly because it does not use pesticides, does not leave residues and water needs are more efficient and plants grow faster (Herwibowo and Budiana, 2014). The disadvantages of hydroponic cultivation systems include the initial investment is quite expensive, labor must be trained and market selection must be appropriate (Haryanto et al., 2007).

Farming

Farming is defined as a science that studies how to allocate available resources effectively and efficiently for the purpose of obtaining high profits at a certain time. It is said to be effective if farmers or producers can allocate the resources they have (controlled) as well as possible and it is said to be efficient

if the utilization of these resources produces outputs that exceed inputs (Soekartawi, 2006).

According to Suratiah (2015), agriculture as a source of human life can be studied from various angles, including technical, technological, biological, sociological, pedagogical, economic, juridical, and political angles. As a science, farming science is a science that studies the ways farmers determine, organize, and coordinate the use of production factors effectively and efficiently, so that the business provides maximum income. Based on the level of success, farming can be seen from the production and productivity of the farm itself. The success of production is emphasized on cultivation patterns and the development of agricultural technology applied in a farm. Some aspects of cultivation that need to be considered are:

- a. The use of superior seeds/seedlings.
- b. The use of the correct cropping pattern system.
- c. Plant maintenance, which must be considered from the application of fertilizers, irrigation, replanting, weeding and pest and disease control.
- d. Harvest and post-harvest handling including storage, so as to produce good quality products.

Farming Costs

In conducting a business activity, it is very important to conduct a financial analysis of the business, because sometimes farmers assume that as long as they can continue to produce the business they are running is profitable, but this does not necessarily prove that the business they are running is feasible. A farm is said to be successful if it can fulfill obligations to pay interest on capital, tools used, wages for outside labor and other means of production including obligations to third parties and can maintain its business sustainability (Ken Suratiah, 2015).

Production costs are very important to know in a business activity because production costs can affect the selling price. Ken Suratiah (2015) states, the cost function describes the relationship between the amount of costs and the level of production, costs can also be divided into fixed costs, namely costs whose amount is not affected by the amount of production and variable costs, namely costs whose amount is affected by the amount of production. Total production costs can be known by adding up fixed costs and variable costs. Production costs are costs incurred in the production process and making certain goods into products, and include goods purchased and services paid. According to Supriyono (2000) cost is the acquisition price sacrificed or used in order to obtain income or revenue that will be used as a deduction from income.

Soekartawi (2006) classifies farming costs into fixed costs and variable costs, more details can be seen in the following explanation:

- a. Fixed cost

Fixed costs are costs that are relatively fixed in amount and continue to be incurred even if a lot or little is produced. Or it can also be referred to as a cost that does not change when there is a change in the quantity of output. Examples of fixed costs include: land rent, taxes, depreciation of production equipment.

b. Variable cost

Variable costs are costs whose size is influenced by the amount of production obtained. In this cost, the amount of costs incurred per unit or per activity is precisely a fixed amount while for the total cost the amount will adjust to the number of units produced or the number of activities carried out. Examples of fixed costs include labor costs, raw material costs, variable capital interest.

Revenue and Income

Revenue or gross income is an income obtained from production during one period calculated from sales or reassessment results. Revenue is obtained from the amount of production multiplied by the price of the product (Suratiah, 2015). According to Soekartawi (2006), revenue is the multiplication of the output produced by the selling price. The more products produced, the higher the price per unit of the product concerned, the greater the total revenue received by the producer. Conversely, if the products produced are few and the price is low, the total revenue received by the producer is smaller. Total revenue is the sum of all production revenues from the sale of a number of products (goods produced). In addition, income is the difference between revenue and all explicit costs. Income data can be used as a measure to see the level of profit or loss of a business. In carrying out farming activities, farmers hope to increase their income so that their daily needs can be met. Prices and productivity are sources of uncertainty factors, so that if prices and productivity change, the income received by farmers also changes. In farming, information about the combination of production factors and price information is needed so that with this information farmers can anticipate changes so that income remains high (Soekartawi, 2006).

METHODOLOGY

The research was conducted in the green house of Tamansari Subdistrict, Tasikmalaya with the technique of determining the location was done intentionally (purposive) with the consideration of being one of the places of production of pagoda mustard commodities. The data collected in this study consisted of primary data and secondary data. The following is the analytical framework used in this study.

a. Cost Analysis

Production costs are obtained from variable cost and fixed cost data, with the calculation of the amount of production incurred during the production process, calculated using the following formula:

$$TC = TFC + TVC \dots\dots\dots (1)$$

Description:

- TC = Total Cost (IDR)
- TFC = Total Fixed Cost (IDR)
- TVC = Total Variable Cost (IDR)

b. Revenue

The calculation of revenue is obtained from the price of the product multiplied by the number of products sold, with the following formula:

$$TR = P_y \times Y \dots\dots\dots (2)$$

Description:

- TR = Total Revenue (IDR)
- P_y = Price (IDR/kgs)
- Y = Production Quantity (kgs)

c. Income

The calculation of income is obtained from the total revenue minus the total costs incurred, with the following formula:

$$I = TR - TC \dots\dots\dots (3)$$

Description:

- I = Income (IDR)
- TR = Total Revenue (IDR)
- TC = Total Cost (IDR)

d. Feasibility Analysis

Measurement of the level of feasibility using the comparison between revenue and total costs. The criteria used are if the ratio between revenue and total costs is greater than one ($R/C \geq 1$) then the business is said to be feasible, but if the ratio between revenue and total costs is less than one ($R/C < 1$) then the business is said to be unfeasible. The following formula is used.

$$R/C = TR/TC \dots\dots\dots (4)$$

Description:

- TR = Total Revenue (IDR)
- TC = Total Cost (IDR)

RESULTS AND DISCUSSION

Cost Analysis

In the stages of analyzing the feasibility of farming on pagoda mustard commodities with a hydroponic wick system model, which consists of analyzing costs, revenue, income, and feasibility.

A. Fixed Cost

Fixed costs are costs whose total amount does not change even if the amount of output produced changes, regardless of the amount of output produced this cost will remain the same amount (Pujawan, 2004).

Fixed costs are all costs incurred during the production process, but the amount is not affected by changes in output or inputs used during production. There are several production tools used in pagoda mustard farming, consisting of digital scales, tubs/basins, bamboo, TDS meter water quality, seedling trays

and pH meters. The supporting equipment consists of saws, nails, measuring cups, handsprayers, scissors.

Based on Table 1, the total fixed costs for farming on pagoda mustard commodities with the hydroponic wick system model in the experimental garden are IDR. 7,422,500 with depreciation costs that must be incurred amounting to IDR. 339,236.

Table 1. Fixed Costs

Components	Volume	Unit	Total (Rupiah)	Age of Tools (month)	Depreciation (IDR/month)
Greenhouse	1	unit	3.550.000	60	59.167
Tray size 38 cm x 30 cm x 12 cm	28	pcs	980.000	24	40.833
TDS meter water quality tester 4in1	1	unit	200.000	3	66.667
Portable High Precision Digital Pen (pH)	1	unit	150.000	3	50.000
Digital Scales	2	Pcs	255.000	24	10.625
Seedling tray	15	Pack	450.000	24	18.750
Bamboo	30	Line	450.000	24	18.750
Cutter	3	Set	75.000	12	6.250
Paranet	10	meter	150.000	12	12.500
Meters	3	Pcs	195.000	36	5.417
Machete	1	Pcs	120.000	24	5.000
Chainsaw	1	Pcs	75.000	24	3.125
Nails	3	Kilograms	45.000	36	1.250
Handsprayer	1	Pcs	65.000	24	2.708
Measuring cup pyrex 1000	1	Unit	125.000	24	5.208
Rulers	6	Pcs	90.000	36	2.500
Pen	1	Box	25.000	6	4.167
Spidol	5	Pcs	75.000	6	12.500
Scissors	5	Pcs	75.000	12	6.250
Plastics	10	Pack	272.500	36	7.569
Total			7.422.500		339.236

Source: Data processed (2022)

B. Variable Costs

Costs incurred when the project starts running are called variable costs, used to show the total costs incurred on various operational purposes in a project, such as the purchase of raw material inputs or labor wages. Variable costs will be incurred every time a production process is carried out, and the amount changes following changes in the amount of production. Based on Table 2, the total variable cost of pagoda mustard greens with the wick system hydroponic model is IDR. 1,788,750.

Table 2. Variable Costs

Components	Volume	Unit	Total (Rupiah)
Benih sawi pagoda <i>varietas</i> Ta Ke Cai F1	4	Pcs	76.000
Kain Flanel	50	Sheets	167.500
Rockwool	4	Pcs	128.000
Pupuk NPK Mutiara (16:16:16)	2	Kgs	40.000
Pupuk daun Gandasil D	2	Kgs	70.000
Pupuk AB <i>Mix Goodplant</i>	4	Liters	281.000
Sterofoam	20	Sheets	200.000
Tenaga Kerja			
Tenaga Kerja Pemeliharaan	1	person per hour	500.000
Biaya tak terduga			326.250
Total			1.788.750

Source: Data processed (2022)

C. Production Costs

Total cost is the sum of all cost components, both fixed and variable costs. The total cost of hydroponic pagoda mustard business in one growing season can be seen in Table 3 as follows.

Table 3. Production Costs

Komponen	Total (Rupiah)
Fixed Cost	339.236
Variable Cost	1.788.750
Total Production Cost	2.127.986

Source: Data processed (2022)

In Table 3, the total costs incurred in pagoda mustard greens farming with the hydroponic wick system model amounted to IDR. 2,127,986 with a smaller proportion of fixed costs compared to variable costs, because it consists of depreciation costs in one growing season.

Revenue and Income Analysis

In the cultivation activities of pagoda mustard greens commodities carried out, consisting of 96 holes with a hydroponic wick system model, producing 13,906 grams. The cost of production of pagoda mustard produced is IDR 131.44 per gram, so the cost of production is IDR 13,144 per 100 grams. The selling price is determined with a profit of 50 percent of the cost of production, the selling price determined is IDR 19,715 per 100 grams of fresh weight. The packaging used is plastic with each package weighing an average of 250 grams.

Table 4. Revenue Pagoda Mustard

Description	Production quantity (gram)	Prices (IDR/100 gram)	Value/Harvest (Rupiah)	Inocme (Rupiah)
Pagoda Mustard	25.000	19.715	4.928.953	2.800.967

Source: Data processed (2022)

The study conducted on the commodity of pagoda mustard greens stated that the level of demand and supply still did not meet the needs, which amounted to 25 percent of the total demand (Pamungkas, 2020). Based on the results of the study, there is potential for farming development in the pagoda mustard commodity, so that in each harvest for 40 days, 25 kilograms or 25,000 grams are sold on the market. The results of the calculation, that the sales of pagoda mustard greens are Rp. 4,928,953 with a selling price of Rp. 19,715 per 100 grams.

Based on the results of the calculation of costs and revenues, the income of the pagoda mustard farm is Rp. 2,800,967, obtained from the difference between fixed costs (depreciation costs) and variable costs.

Feasibility Analysis

The feasibility analysis carried out is based on the background that running a business that is carried out is expected to bring large profits. To measure whether the business is feasible or not can be known by calculating the value of the ratio between revenue and costs incurred.

Table 5. Feasibility of Pagoda Mustard Business

Components	Value
Production Cost	IDR. 2.127.986
Revenue	IDR. 4.928.953
R/C	2,31

Based on the calculation results of Table 5, it shows that the ratio of revenue to production costs is 2.31. This means that the pagoda mustard business is said to be feasible ($R/C \geq 1$). From the calculation results show that with a cost of IDR. 2,127,986 will generate 2.31 times the revenue.

CONCLUSIONS AND RECOMMENDATIONS

From the results of the analysis conducted on the farming of pagoda mustard greens with a hydroponic wick system model in the research area is economically feasible to be cultivated and developed. This can be seen from the value of the comparison of revenue with production costs greater than one, namely 2.31.

FURTHER STUDY

This research can make an important contribution to the development of pagoda mustard farming business by introducing a wick hydroponic model. In addition, this research can provide practical guidance for farmers and entrepreneurs who want to improve the efficiency and sustainability of their farming business.

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