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BUSINESS ANALYSIS AND VEGETABLE HYDROPONIC MARKETING

Analisis Usaha Dan Pemasaran Sayuran Hidroponik

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ABSTRACT

This research aims to investigate the income, feasibility, and marketing efficiency in hydroponic spinach farming in the Percut Sei Tuan District, Deli Serdang Regency, in December 2021. Primary data were collected from 23 respondents, including 8 hydroponic farmers, 3 collectors, 5 wholesalers, and 7 consumers, through questionnaire interviews. Analysis was conducted to assess farm income using the R/C ratio, business feasibility with BEP Volume, BEP price, and Payback Period, and marketing efficiency by comparing profit margins. The research findings indicate an average income of Rp. 13,393,328 per planting season with an average land area of 294.50 m2. Feasibility analysis reveals that hydroponic farming is viable with an R/C Ratio > 1 (3.08), BEP Volume = 347.98 kg, BEP price = Rp 8,237, and Payback Period (PP) = 0.33. Marketing efficiency is evident, with all three marketing channels having efficiency values < 50%, namely Channel I: 1.47%, Channel II: 1.51%, and Channel III: 1.1%. Therefore, the BEP is considered viable if its value exceeds the achieved production and the BEP price surpasses the market selling price of the product.

Keyword: farm viability, income, marketing efficiency

ABSTRAK

Penelitian ini bertujuan menginvestigasi pendapatan, kelayakan, dan efisiensi pemasaran dalam usahatani bayam hidroponik di Kecamatan Percut Sei Tuan, Kabupaten Deli Serdang, pada Desember 2021. Data primer dikumpulkan dari 23 responden, termasuk 8 pelaku usaha hidroponik, 3 pengepul, 5 pedagang grosir, dan 7 konsumen, melalui wawancara dengan kuesioner. Analisis dilakukan untuk menilai pendapatan usahatani dengan R/C rasio, kelayakan usaha dengan BEP Volume, harga BEP, dan Payback Period, serta efisiensi pemasaran dengan membandingkan margin saham. Hasil penelitian menunjukkan pendapatan rata-rata petani bayam hidroponik Rp. 13.393.328 per masa tanam dengan luas lahan rata-rata 294,50 m2. Analisis kelayakan menunjukkan usahatani layak dengan R/C Ratio > 1 (3,08), BEP Volume = 347,98 kg, harga BEP = Rp 8.237, dan Payback Period (PP) = 0,33. Efisiensi pemasaran terbukti, dengan ketiga saluran pemasaran memiliki nilai efisiensi < 50%, yaitu Saluran I: 1,47%, Saluran II: 1,51%, dan Saluran III: 1,1%. Dengan demikian, BEP dianggap layak jika nilainya lebih tinggi dari produksi yang dicapai dan harga BEP lebih tinggi dari harga jual produk di pasaran.

Kata Kunci: kelayakan usahatani, pendapatan, efisiensi pemasaran

INTRODUCTION

The consumer demand for locally grown fresh produce is continuously increasing in Indonesia. One of the challenges encountered by owners of hydroponic spinach vegetable farming businesses is the limited land available for cultivation, primarily located within residential premises. This spatial constraint inhibits proper analysis and assessment of their enterprises. Consequently, many farmers neglect thorough financial evaluations, leading to a lack of understanding regarding their business's revenue potential. This oversight hampers strategic decision-making and impedes the overall development of the spinach hydroponic vegetable farming sector. The disadvantages of this hydroponic system are: Early investment costs are more expensive and strongly impacted by concentration and composition, fertilizer, pH, and temperature. One of the reasons why hydroponic veggies are considered exclusive is because vegetables produced using a hydroponic growing method are fresh, long-lasting, and easy to digest without industrial heavy metal pollution in the soil; because it's easy to accomplish, it can be healthier. The advantage of growing in a hydroponic system is that it is easy to grow plants renewed without depending on land conditions and planting season, growth and harvest quality can be regulated, labour saving, products produced are cleaner and more hygienic, save water and fertilizer (convenient for environmental sustainability), shorter planting period. According to recent studies (Wiyono et al., 2021), the dwindling availability of agricultural land poses a significant challenge to traditional farming practices. However, hydroponic systems emerge as a promising solution to this issue. Indonesia, known for its rich agricultural landscape and diverse local food resources, holds immense potential for further development (Herawati & Kamsiati, 2021). Particularly, horticulture stands out as a pivotal sector capable of driving economic growth, poverty alleviation, and employment opportunities (Kour et al., 2022). Hydroponics, characterized by its soil-free cultivation method utilizing mineral nutrient solutions or inert media like vermiculite perlite, represents a sustainable farming technique. By eliminating the need for substantial water and agrochemical inputs, hydroponics enables high annual crop yields. Additionally, this method minimizes the risk of soil-borne diseases and pathogens typically associated with traditional open-field farming (Saldinger et al., 2023). Therefore, hydroponics holds great promise for bolstering agricultural productivity and sustainability in Indonesia and beyond.

The findings from recent studies (Sisodia et al., 2021) underscore the potential benefits of widespread adoption of hydroponic farming. Increased popularity of hydroponic farms could enhance community access to fresh produce, thereby promoting healthier dietary choices. Moreover, heightened engagement in agricultural activities is poised to stimulate the growth of agriculture-related businesses and bolster overall employability rates. Further insights from research conducted by Hardiansyah & Harsanti (2021) shed light on the financial viability of hydroponic ventures, exemplified by Bogor Veggies business. Their analysis reveals a promising financial outlook, with a payback period of one year, four months, and one day, a Net Present Value (NPV) of IDR 126,869,865, an Internal Rate of Return (IRR) of 49%, and a profitability index of 3.504%. Additionally, investigations by Prayoga & Putra (2020) elucidate the essence of hydroponic technology as a soil-less farming method, relying on water-based media. By bypassing traditional soil-based systems, hydroponics streamlines nutrient delivery, water supply, and oxygenation, thereby optimizing plant growth and productivity. This underscores the potential of hydroponics to revolutionize conventional farming practices and contribute to sustainable agricultural development.

In response to the evolving market dynamics, the establishment of a spinach hydroponic vegetable business in the Percut Sei Tuan District, Deli Serdang Regency, North Sumatra Province, was initiated with the primary objective of addressing the growing demand for hydroponic vegetables. The fluctuating population trends and shifts in vegetable demand, particularly amidst the pandemic, necessitate an augmentation in hydroponic vegetable production. Preliminary observations conducted with business proprietors revealed a nuanced understanding of market dynamics, highlighting the dependence of hydroponic vegetable demand on consumer preferences. Furthermore, the investigation identified three predominant types of spinach vegetables—Green Spinach, Red Spinach, and Batik Spinach—presenting a diverse but singularly categorized market offering. Given that vegetables are typically marketed in kilogram units at varying prices, a comprehensive study becomes imperative to ascertain market dynamics accurately. Moreover, spinach farming serves as a vital source of income for local farmers, further underscoring the significance of this research endeavor. Consequently, this study aims to achieve three primary objectives: 1) to quantify the income generated by hydroponic spinach vegetable farming in the Percut Sei Tuan District; 2) to assess the feasibility of hydroponic spinach vegetable farming in the same area; and 3) to evaluate the marketing efficiency of hydroponic spinach vegetable farming within the Percut Sei Tuan District. Through meticulous investigation and analysis, this research seeks to provide valuable insights into the viability and sustainability of hydroponic vegetable farming in the region.

Hydroponic systems represent an appealing facet of urban agriculture owing to their lightweight structure, utilization of inert substrates, and enhanced control over nutrients and growth of plants. Nonetheless, although hydroponics offers an allure for achieving urban food sovereignty, it must not exacerbate environmental issues like eutrophication and the depletion of nonrenewable resources, especially phosphorus fertilizers (Arcas-Pilz et al., 2022). Hydroponics, as a soilless cultivation method utilizing nutrient solutions in water, has witnessed substantial global and Indonesian agricultural development, particularly in tandem with the rise of hydroponic vegetable production (Suroso et al., 2021). This highlights the imperative of adopting sustainable practices in hydroponic agriculture to mitigate environmental impacts and ensure long-term viability and resilience in food production systems.

The study revealed significant relationships between hydroponic farmer interpersonal networks and WA media gratification with various centrality types in both the socialization and social support dimensions. Specifically, there were significant associations with closeness and eigenvector centrality in the socialization dimension, as well as degree and betweenness centrality in the social support dimension. These findings underscore the importance of central actors in facilitating effective communication processes, particularly in establishing robust network relationships and addressing hydroponic vegetable marketing challenges (Prasetiyo et al., 2021). Moreover, as highlighted by Van Gerrewey et al. (2022), vertical farming is emerging as a complement to traditional agricultural practices, offering promising prospects for sustainable food production amid escalating climate pressures. From a social perspective, more effective vegetable marketing strategies have the potential to stimulate consumption, thereby enhancing consumer welfare and potentially reducing healthcare costs (Darian & Tucci, 2013). These insights underscore the critical role of interpersonal networks and innovative farming practices in addressing contemporary agricultural challenges and promoting societal well-being.

RESEARCH METHOD

Location and Time

The study was conducted in Indonesia's North Sumatra Province in the Percut Sei Tuan District of the Deli Serdang Regency. Purposive sampling was used in the research area selection process because Percut Sei Tuan has several hydroponic vegetable farming enterprises and is a sizable area inside the Deli Serdang neighborhood. The research was conducted in December 2022 and employed a case study methodology. Case studies are particularly suited for investigations with specific and directed objectives rather than generalized applicability (Hernosa et al., 2021). This research adopts a descriptive and quantitative approach, aimed at delineating and identifying the predominant types of presupposition (Chen & Cheng, 2022). The study focuses exclusively on hydroponic spinach cultivation, with each respondent operating on an average land area of 294 square meters. Throughout the year, these respondents engage in five planting cycles.

In terms of data analysis methods, a straightforward tabulation approach is used to assess the problem's initial formulation (Alkahtani et al., 2020). The following formula can be used to determine income:

$$Pd = TR - TC$$

Note:

Pd: Farm Business Income (IDR)
TR: Total Revenue (IDR)
TC: Total production cost of Farm Business (IDR)

To analyze the formulation of the 2nd (second) problem to find out the feasible/unfit of Farming Business, it is analyzed using the following formula:

$$R/C \; ratio = \frac{TR}{TC}$$

Note :

R/C: Revenue Cost Rasio
TR: Total Revenue (IDR)
TC: Total Cost (IDR) (Hernosa et al., 2022b).

Criteria:

R/C > 1, Farming business is worth trying to do
R/C < 1, Farming is not worth trying to do
R/C = 1, Farming Business is said to break even

The break-even point serves as a fundamental tool in financial analysis, aiding in informed decision-making within business operations. This calculation determines the precise sales volume required to cover both operating expenses and variable costs, thereby elucidating the economic threshold between profit and loss. Essentially, the break-even point signifies the juncture at which business activity neither generates profit nor incurs losses, marking the attainment of operational equilibrium (Cortés, 2023). Through its meticulous computation, this tool empowers businesses to strategize effectively and optimize their financial performance.

BEP is declared feasible when the BEP value > the amount of production achieved; and BEP price value > product selling price on the market.

$$BEP_{Volume(Kg)} = \frac{TC}{P_i}$$

Note:

TC: Total cost of Hydroponic Vegetable Farming Business
Pi: Hydroponic Vegetable Sales Price

Next, the Payback period analysis is useful from a risk analysis perspective, as it gives a quick overview of how long the initial investment will be risky with the formula (Mahlia, et al., 2011). The length of the period is annual,

$$\text{Payback Period} = \frac{\text{Investment Required}}{\text{Net Annual Cash Inflow}}$$

Formula marketing efficiency. To calculate the efficiency of rice (Ep) marketing, it can be measured by the formula (Saadah, et al., 2021):

$$\text{Marketing Efficiency} = \frac{\text{Marketing Cost}}{\text{Retail Price}}$$

Note: if Marketing Efficiency < 5%, then Efficiency
if Marketing Efficiency > 5%, then Inefficiency

The focus of this study is the population, which serves as the subject of analysis and facilitates data processing. Specifically, the population comprised 70 spinach farmers within the study site. Purposive Judgment Sampling was employed as the sampling method, wherein samples were selected based on predetermined criteria: farmers with over two years of farming experience and a demonstrated commitment to sustainable hydroponic spinach cultivation practices. By ensuring alignment with these criteria, the sample reflects the characteristics of the broader population. In this study, the researcher opted for a sample size of 23 participants to streamline data processing and enhance the credibility of the findings. The descriptive method was utilized to identify and analyze marketing channels. Data collection techniques were informed by a comprehensive understanding of sampling methods, with critical questions aiding in sample selection (Hernosa, et al., 2022a). This rigorous approach underscores the methodological integrity of the research and enhances the validity of the outcomes.

RESULT AND DISCUSSION

Fixed Costs

Fixed costs, one part of the sales strategy, are necessary—from understanding fixed costs to how they are used in a business. Because fixed costs are also a sales strategy that can provide profits for every business. Businesses can manage prices and still get appropriate profits by knowing fixed costs. This will be explained in the discussion in the first part of the article.

Table 1 shows the average fixed price for the spinach hydroponic vegetable farming operation, which is determined by adding labor costs to depreciation costs. According to Table 1, each respondent or hydroponic spinach vegetable farming business in Percut Sei Tuan District has a different cost; sample number 3 simply has a fixed monthly cost of IDR 195,150, whereas sample numbers 1 through 5 require rupiah. Table I. Based on sample number 7 and the average fixed cost of hydroponic spinach vegetable producers in Percut Sei Tuan District each planting period, business actors issue fixed costs of IDR 11,086,083 per month. This notable disparity in cost is a result of variations in labor needs, equipment quantity and quality, and both. Sample number three respondents did not have a greenhouse; instead, they used ordinary hydroponic gear. According to Singh and Chandra (2018), a greenhouse is a controlled agricultural environment where vital elements like temperature, light, humidity, and soil pH level can be tracked using sensor systems and Internet of Things protocols. A greenhouse is a construction that prevents and alters external conditionsate the necessary environmental conditions for keeping plants. With a Green House, environmental conditions may be modified according to the company's needs so that production can operate well, decreasing production failures and enhancing productivity.

The name Greenhouse Effect stems from the experience of farmers in temperate areas who cultivate vegetables and flowers in greenhouses. Usually, the plant variations grown hydroponically are various vegetables, including spinach, kale, bok choy, caisim, lettuce, and white mustard greens. Planting of vegetable varieties is also adjusted to the schedule specified by the teaching staff and those who manage the Green House area. If you don't use a greenhouse, hydroponic plant growing can receive too much sunshine. Especially during the summer, the intensity of the incoming light can interrupt the plant growth process. However, with a greenhouse or greenhouse, the intensity of sunlight can be changed according to demands. Plants will not wilt easily or lack fluids.

It also minimizes the cost of spending on plant fertilizers and hydroponic media because the evaporation rate can be controlled. Meanwhile, when the rainy season begins, the leaves and stems of the plants will be exposed to moisture. This disease often produces new difficulties in the form of rot on plant leaves and stems. fungus, moss, and other nuisance plants will thrive in the wet season. If left untreated, this bug might create more significant complications. Hydroponic nutrients that cultivated plants should be absorbed by weeds and the like. One of the greatest solutions to this probthis problem is building the plant cultivation area. So that extra rainwater cannot penetrate the planting media or the leaves and stems of hydroponic plants.

They did not engage in labor-intensive operations for their hydroponic vegetable business, given their relatively small land area of only 100 m^2. Conversely, respondents, particularly sample number 7, who established a greenhouse for hydroponic spinach vegetable farming, incurred significantly higher costs and required labor for operational activities. This finding aligns with research conducted by Jubandi et al. (2022), which indicates that fixed labor and distribution costs constitute the highest fixed cost components, while daily labor costs are the primary variable cost components. Fixed costs remain constant throughout the production process and do not fluctuate with changes in production levels in the short term, only potentially varying over an extended period. Therefore, while the smaller-scale operations may necessitate minimal labor expenses, larger-scale ventures with greenhouse infrastructure entail more substantial monthly expenditures due to increased labor requirements.

Table 1. Average Fixed Cost of Spinach Hydroponic Vegetable Farmers in Percutsei Tuan District Per Planting Period Per Month

Sample Number	Land (m^2)	Tool Depreciation Costs (IDR)	Labor Costs (IDR)	Total fixed costs (IDR)
1	156.00	394,875.00	2,340,000	2,734,875
2	180.00	308,250.00	3,276,000	3,584,250
3	100.00	195,150.00	-	195,150
4	220.00	377,083.00	3,978,000	4,355,083
5	200.00	831,181.00	3,276,000	4,107,181
6	200.00	841,172.00	3,276,000	4,117,172
7	800.00	790,083.00	10,296,000	11,086,083
8	500.00	750,083.00	5,616,000	6,366,083
Average	294.50	560.984.63	4,007,250	4,568,235

Source: Primary Data Processed, 2022

Variable Cost

Variable costs within the context of spinach hydroponic farming are contingent upon production volume. These costs primarily encompass direct inputs related to spinach cultivation, including labor, seeds, equipment maintenance, distribution fuel, marketing expenses, and other associated costs. In contrast, fixed costs represent consistent overhead expenses that remain unchanged regardless of production levels. Analysis presented in Table 2 indicates variations in variable costs among farmers, predominantly influenced by land area. Specifically, larger land holdings necessitate increased material and facility requirements, thus driving up variable costs. Notably, plastic packing emerges as the variable cost with the lowest value, as evidenced by a mere IDR 90,000 expenditure for respondent 3, compared to IDR 675,000 for respondent 7. This differential expenditure underscores the nuanced cost dynamics inherent to hydroponic vegetable farming, emphasizing the need for meticulous cost management strategies tailored to individual farm operations. The specific situation required per sample is to increase the production of hydroponic spinach vegetables by adding new cultivation land area. The sample taken in this research is a representative sample or represents the population. With a sample size of 23 respondents, consisting of 8 respondents who are hydroponic business owners, 3 collecting traders, 5 wholesalers, and 7 consumers. The sample is just a replication of data for observation purposes in research.

According to Stougiannidou & Zafeiriou (2022), variable costs are costs that chame changes. Examples of variable costs are raw materials, piece-rate labor, production supplies, commissions, delivery costs, packaging supplies, and credit card fees. In some accounting statements, the Variable production costs are called the "Cost of Goods Sold." A cost can be fixed for some kinds of businesses but variable for other types of businesses. As noted above, variable costs are continuous with production costs. Another issue to pay attention to is the cost of raw materials. When making an item, the raw materials purchased frequently have variable pricing. Fluctuations in raw material prices reflect the prevailing market process. Therefore, purchases of raw materials cannot always be represented as constant costs because their nature typically varies over time. However, in constructing the budget, costs need to be noted as a reference for the basic charges that need to be incurred. Variable costs are a calculation whose value or amount can change based on the firm's financial conditions. The firm's financial conditions originate from the income the corporation earns from business units already operational.

Variable costs are costs whose size directly influences the number influenceable costs are added, the products sold also increase, and so on the contrary. If variable expenses are lowered, the number of products sold falls. Variable costs include the cost of sourcing veggies and packaging fees.

Feasibility Analysis

The hydroponic vegetable business carried out by farmers or entrepreneurs must produce sustainable profits, so conducting a business feasibility analysis is necessary. A feasibility study is vital when establishing the viability of a project. It evaluates numerous facets of a project, personnel, and resources needed so that organizations may establish actionable strategies. Understanding what this study is and what it entails enables you to make informed business decisions. In this post, we define what a feasibility study is, why it's necessary, and explore the main aspects of a feasibility study. As a new product, conducting a business feasibility analysis is required to reduce the risk of failure or loss (Dewi & Danaryanti, 2022).

Feasibility study has essential value for the global development business. The failure of farming enterprises and agricultural household businesses is part of not implementing feasibility studies adequately. Theoretically, if a correct feasibility analysis precedes every farming enterprise, the risk of failure and loss can be minimized as minimal as feasible. In analyzing whether the agricultural business is possible or not, balancing and R/C analysis can be carried out.

R/C Analysis

The Return Cost Ratio (R/C ratio) technique, which divides the average receipt of an agroindustry by the total cost of production, can be used to determine the viability of a farm business. A Business Feasibility Study can be characterized as a controlled procedure for identifying challenges and opportunities, creating objectives, describing situations, defining successful outcomes, and estimating the range of costs and benefits associated with different choices for solving a problem. A business feasibility study is an activity that analyzes in depth the business that will be conducted to assess whether the firm is worth doing.

According to Table 2., every respondent's R/C ratio varies and ultimately reaches 1. When the ratio's R/C value is greater than 1, the business is deemed viable to operate according to the specifications for business feasibility. A profit of IDR 3,080,000 was obtained when the Farm Business's total costs were calculated and an average R/C ratio of 3.08 was produced. A plausible business initiative is one where the business will generate appropriate flow and earnings, endure the dangers it will experience, remain sustainable in the long term, and satisfy the founders' goals. Farmers and others with a business concept should do a feasibility study to determine the viability of their idea before advancing with the establishment of a firm. The viability of the R/C ratio value is generated from revenues that are more than the entire costs sacrificed. In this farming industry, the entire costs incurred to run the production process. The utilization of labor in the production process must be carried out humanely, companies must obey the regulations provided by the government in establishing the amount of workers' pay.

Table 2. The Average Variable Cost of Spinach Hydroponic Vegetable Farmers In Percut Sei Tuan District Per Planting Period

Sample	Land (M^2)	Seed Cost	Planting Media Cost	Nutrient Costs	Electricity Costs	Plastic Packing Cost	Transport. Costs	Total Cost
1	156	150,000	650,000	450,000	150,000	120,000	250,000	1,770,000
2	180	150,000	650,000	450,000	170,000	135,000	250,000	1,805,000
3	100	97,500	32,500	240,000	150,000	90,000	150,000	760,000
4	220	172,500	845,000	560,000	180,000	195,000	300,000	2,252,500
5	200	162,500	780,000	560,000	150,000	180,000	300,000	2,132,500
6	200	162,500	780,000	630,000	170,000	180,000	300,000	2,222,500
7	800	750,000	3,250,000	3,000,000	400,000	675,000	500,000	8,575,000
8	500	450,000	1,950,000	1,500,000	300,000	450,000	350,000	5,000,000
Total	2356	2,095,000	8,937,500	7390000	1670000	2025000	2400000	24,517,500
Average	294.5	261,875	1,117,187.5	923,750	208,750	253,125	300,000	3,064,688

Source: Primary Data Processed, 2022

Table 3. R/C Analysis of Spinach Hydroponic Vegetable Farming Ratio in Percut Sei Tuan District

Sample	Revenue (IDR)	Total Cost (IDR)	R/C Ratio
1	10,000,000	3,664,875	2.22
2	11,520,000	3,553,250	2.14
3	7,360,000	955,150	7.71
4	13,200,000	5,929,583	2.00
5	13,230,000	5,363,681	2.12
6	12,600,000	5,063,672	1.99
7	64,000,000	18,815,083	3.26
8	36,300,000	10,150,083	3.19
Total	168,210,000	53,495,377	25
Average	21,026,250	6,686,922	3.08

Source: Primary Data Processed, 2022

Break Event Point (BEP) Analysis of Spinach Hydroponic Vegetable Business

Balance analysis, or what is typically called Break Event Point (BEP) analysis, is an analysis to evaluate the link between sales, costs, and profits. Break events are in a lossless state. This Break Event Point study investigates the mutual relationship between cost income and profit. In general, BEP is the break-even point, which refers to the amount of income needed to pay the total costs incurred within a specific period, both fixed and variable. The break-even point or BEP is when the total costs incurred are equal to the price of the goods, aka return on investment. The break-even point (BEP) refers to the point at which a company's revenue and expenses are equal. It is when the company neither makes a profit nor incurs a loss. In other words, the BEP symbolizes the break-even moment or the point of return on investment, making it a key part of business. A low breakeven point suggests that the business will start making a profit sooner, whereas a high breakeven point means more products or services need to be sold to reach that threshold. Table 4. shows the BEP calculation for a single planting period in the Percut Sei Tuan District's hydroponic spinach vegetable agricultural operation. The highest Break Even Point Production IDR 10,062.97 is found in the sixth sample.

Table 4. Break Event Point (BEP) Analysis of Hydroponic Spinach Vegetable Farming Busines

Sample	Land (m^2)	Seed Cost	Total Cost (IDR)	Price (IDR/kg)	Electricity Costs	Plastic Packing Cost	Transport Costs	Total Overall Cost
1	156	150,000	4,504,875	20,000	150,000	120,000	250,000	1,770,000
2	180	150,000	5,389,250	20,000	170,000	135,000	250,000	1,805,000
3	100	97,500	955,150	23,000	150,000	90,000	150,000	760,000
4	220	172,500	6,607,583	20,000	180,000	195,000	300,000	2,252,500
5	200	162,500	6,239,681	21,000	150,000	180,000	300,000	2,132,500
6	200	162,500	6,339,672	20,000	170,000	180,000	300,000	2,222,500
7	800	750,000	19,661,083	25,000	400,000	675,000	500,000	8,575,000
8	500	450,000	11,366,083	22,000	300,000	450,000	350,000	5,000,000
Total	2356	2,095,000	61,063,377	171,000	1670000	2025000	2400000	24,517,500
Average	294.5	261,875	7,632,922	21,375	208,750	253,125	300,000	3,064,688

Source: Primary Data Processed, 2022

Payback Period Analysis

The payback period approach is used to quickly analyze the time it should take for an investor to get back the amount of money put into a project. The payback period is the period required to repay the initial capital of the business. Business owners will desire a quick payback period. One of the biggest problems of the payback period is that it ignores the time worth of money. According to the principle of time value of money, money received is worth sooner rather than later. Due to its ability to produce more returns if reinvested. Those investments with even cash flows are computed by dividing the investment cost by the annual net cash flow. To discover how to calculate the payback period in practice, simply divide the initial cash outlay of a project by the amount of net cash inflow generated each year. To compute the payback time formula, you can assume that the net cash inflow is the same each year. The payback period is an essential topic in business and investment. This notion helps business actors and investors determine how quickly an investment will be able to recover the capital invested.

The Payback Period (PP) analysis is vital for evaluating capital return in hydroponic vegetable farming, with a focus on spinach cultivation in Percut Sei Tuan District. By comparing investment and income, this analysis determines the time needed to recover initial capital outlay. Results from Table 5 show an average PP of 0.33 years for hydroponic spinach farming in the district. Notably, respondent 7, investing significantly in greenhouse infrastructure (IDR 94,810,000), has the longest payback period due to substantial capital investment. Conversely, other respondents using UV or paranet plastics have shorter payback periods due to lower costs. Greenhouses are favored for their extended economic lifespan over UV plastics. With an average annual income of IDR 160,719,934.50, enhanced productivity resulting from increased investment is evident. These findings have practical implications for producers seeking to boost productivity and reduce costs. Government agencies can use this data to refine regulatory standards and support mechanisms. Emphasizing the significance of swift payback periods, corporations should prioritize investments with shorter durations to maximize capital efficiency. Expanding cultivation land area offers a viable strategy for long-term sustainability, with the longest project lifespan at 0.65 years.

Table 5. Payback Period Analysis (PP) Of Spinach Hydroponic Vegetable Farming Business in Percut Sei Tuan District.

Sample No.	Investment Costs	Operating Income/year	Payback Period
1	19,155,000.00	65,941,500.00	0.29
2	18,440,000.00	73,569,000.00	0.25
3	11,819,000.00	76,858,200.00	0.15
4	22,647,500.00	79,109,004.00	0.29
5	48,047,500.00	83,883,828.00	0.57
6	48,529,500.00	75,123,936.00	0.65
7	94,810,000.00	532,067,004.00	0.18
8	90,010,000.00	299,207,004.00	0.30
Total	353,458,500.00	1,285,759,476.00	2.68
Average	44,182,312.50	160,719,934.50	0.33

Source: Primary Data Processed, 2022

Analysis of Spinach Hydroponic Vegetable Farming Business

In conducting business operations, it is imperative to conduct thorough financial analysis to ascertain the viability of ventures, including Farm Business endeavors. Such analyses aim to delineate revenue streams, incurred costs, and the sustainability of the business, often gauged through the R/C ratio (Hunter, et al., 2019). The results show that, with an average R/C ratio of 3.08, the hydroponic spinach vegetable farming enterprise in Percut Sei Tuan District exhibits a positive future. This shows that IDR 3,080,000 is made in profit for every IDR 1,000,000 put in agricultural expenses. Hydroponic technology, characterized by its ability to maximize plant density in limited spaces, augments production and profitability (Nursahib, et al., 2021). The feasibility of the R/C ratio hinges on total receipts vis-à-vis overall costs incurred. In this case, the average cost of production is IDR 7,632,922, which includes labor costs, cultivation supplies including seeds and nutrients, and equipment depreciation costs. Labor costs emerge as the most significant expense, constituting 52.5% of total costs at IDR 4,007,250, whereas equipment depreciation accounts for only 7.3%, totaling IDR 560,984. This underscores the importance of labor management and operational efficiency in optimizing cost structures. 40.2% of the total costs, namely with a nominal value of IDR 3,064,688.

Marketing Analysis

The research method used is a case study. Marketing efficiency can be seen by looking at the length of the marketing channel in marketing a product. The longer the marketing channel, the more marketing institutions are involved, the smaller the marketing efficiency. Marketing channel 1 is Farmers → Collectors → Wholesalers → Consumers. Marketing channel 2 is Farmers → Wholesalers → Consumers and marketing channel 3 is Farmers→ Consumers. The cost structure of hydroponic spinach farming warrants meticulous analysis to delineate expenses incurred and allocate costs effectively across various activities (Trisnanto & Muttaqin, 2021). According to an analysis of the Percut Sei Tuan District's spinach hydroponic vegetable farming business, there are three different marketing channels that are all rather effective—all of them have efficiency ratings that are less than 50% (Istiyanti et al., 2021). Contrary to Istiyanti's assertion that channels with efficiency values exceeding 50% are inefficient, our findings suggest otherwise. Notably, administrative costs remain below the 50% benchmark, indicative of efficient marketing practices. This efficiency is further bolstered by the relatively high selling prices of spinach vegetables, mitigating agribusiness costs. Disparities in marketing margin analysis across institutions stem from divergent commercial expenses and spinach selling prices. Notably, Channel III, facilitating direct sales from farmers to consumers, emerges as the most efficient marketing channel. With the lowest marketing costs per kilogram at IDR 275 and an efficiency percentage of 1.1%, Channel III circumvents transportation expenses, a significant contributor to marketing costs in other channels. As such, Channel III offers a cost-effective avenue for delivering products to consumers, underscoring its efficacy in reducing commerce-related expenses.

Despite the efficiency of Channel III, Channel I, involving merchant collectors, large traders, and consumers, remains prevalent in practice. Farmers often opt to sell their products to collecting merchants, even though the selling price may not be as lucrative as direct sales to consumers. This preference echoes findings from research conducted by Bosch et al. (2012), wherein farmers consistently favored selling their crops to collectors. The inclination towards this channel can be attributed to farmers' concerns regarding post-harvest risks, as agricultural products are prone to rapid deterioration. Selling to collectors mitigates these risks, as merchants purchase large quantities and may even acquire the entire crop, ensuring the marketing of the products to consumers. Despite potentially lower prices, the reliability and efficiency of selling to collectors provide farmers with a sense of security and convenience in managing their produce. To promote hydroponic items, you can sell them directly to customers from the garden. This will make potential purchasers believe in the quality of the vegetables presented. Apart from that, selling vegetables directly from the garden can provide a different experience for buyers. Plus, this strategy can help reduce transportation costs and other expenses. So, there is no need to go to numerous places to market hydroponic crops previously picked.

CONCLUSION AND SUGGESTION

Conclusion

Farmers in the Percut Sei Tuan district's spinach hydroponic vegetable farming sector earn an average of IDR 13,393,328 every planting cycle, working on an average land size of 294.50 m^2. The R/C ratio surpasses one, peaking at 3.08, indicating the profitability of the business. There is a profit of IDR 3,080,000 for every IDR 1,000,000 spent on overall farm costs. The BEP volume is 347.98/kg, with a selling price of IDR 21,375 and a Price BEP value of IDR 8,237 per kg. The Payback Period (PP) is 0.33, with an investment value of IDR 44,182,312.50 and annual income of IDR 160,719,934.50. In Percut Sei Tuan, hydroponic spinach vegetable producers employ three primary marketing channels, categorized as levels 1, 2, and 3. Channel I emerges as the preferred option, facilitating product sales for farmers conveniently. These channels involve farmers, intermediaries, consumers, wholesalers, and primary producer-level marketing channels. Merchant collectors, large traders, and consumers exhibit efficiency, with values not exceeding 50%, suggesting effective market engagement. At the intermediary level, the efficiency value for collecting traders is 7.9%, with a margin of IDR 6,667, while for large traders to consumers, the efficiency value is 1.47%, with a margin of IDR 4,500. Marketing channel 1 is Farmers → Collectors → Wholesalers → Consumers. Marketing channel 2 is

Farmers → Wholesalers → Consumers and marketing channel 3 is Farmers→ Consumers. Marketing channels at level III Farmers → Consumers can be said to be efficient, because the efficiency value is still < 50% with an efficiency value of 1.1%.

Suggestion

The suggestion is that Spinach should make more hydroponically grown vegetables to exploit the open market. Wholesalers should be involved in both planting and processing to maximize profits. The Deli Serdang Agriculture Office and the local government have shared information on hydroponic vegetable farming on social media.

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