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Economic Feasibility of Floating Cultivation System on Swampland

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ABSTRACT

Swampland is one of the agroecosystems that has not been optimally utilized, especially in agriculture. This land is included in sub obtimal land in South Sumatera province. This research aims to determine the feasibility of horticulture cultivation efforts with floating methods on swampland. The location of the research was the swampland in Srimulya Village, Sematang Borang District of Palembang City on inundated season from January to June. This study was conducted by combining interview methods and participatory observation with respondents. The method used in determining economic feasibility was business feasibility analysis using R/C and B/C Ratios. The types of data processed were primary data and secondary data with quantitative type. Based on the results, it can be concluded that floating cultivation system for kale can add family income to swampland. With the total cost of each harvest being Rp 4.390.000,00 , an acceptance of Rp 14.000.000,00 is obtained. The net income earned every harvest is Rp 9.610.000,00. The Revenue / Cost Ratio is 3.19 while Benefit / Cost Ratio is 2.19. It can be concluded that the floating cultivation system is feasible to be implemented on swampland.

Keywords: *Feasibility, Floating Cultivation System, Income, Kale, Swampland*

INTRODUCTION

Swampland is a very important agroecosystem in South Sumatra Province. This land is affected by rainfall and river overflow. Differences in elevation at ground level result in inundation that eventually becomes a swamp, It usually occurs along with large river flows. Inundation usually decreases during the dry season and increases in the rainy season (Syahputra and Inan 2019).

Based on the height of the inundation, swamps are categorized into three types namely, shallow swamp, medium swamp, and deep swamp. Based on hydro topography, swamps are categorized as shallow when the inundations occur less than three months and less than 50 cm in depth; they are moderate if the duration of inundation is 3 to 6 months with 50 cm to 100 cm depth, and they belong to deep category with more than 100 cm depth, with the durations of inundation more than six months (Suparwoto and Waluyo 2019).

Swampland has a potential into an integrated farm for food crops, livestock, and plantations by adjusting land conditions and using environmentally friendly technology (Suryana 2016).

During this time, swamps in South Sumatra are still less productive and becomes sub-optimal land. For swamps with shallow and medium depth, the swamps can be planted with rice one to two times a year, but deep swamps can only be planted with rice once a year (Pujiharti 2017).

A Floating Culture System (FCS) is a method of crop cultivation that can be applied to food and horticulture plants on swampland. FCS can be done during the inundated period around January to June. Compared to conventional cultivation, the FCS method has the advantage of not needing to water the plant as long as the bottom of the substrate touches the surface of the water.

According to Jaya et al. 2019, by using the FCS method, direct contact between the water surface and the substrate can increase the moisture of the water, growth of shoots and fruit yield. The application of FCS to the cultivation of chili in swampland has resulted in superior growth compared to conventional planting (Siaga et al. 2018).

Other research on FCS has also been conducted in several places such as in Bangladesh in which farmers conducted FCS in an integrated manner with the cultivation of Tilapia and Goldfish which provided economic benefits to farmers' households with a Benefit-Cost Ratio of >1 and increased efficiency value in investments made by farmers (Haque et al. 2015).

Research conducted by Sunny et al. (2019) showed that creating FCS in coastal areas with a Keramba system for fish farms integrated with vegetables on top has the potential to improve the food security of farmers' households and reduce susceptibility to tidal waves and floods. The FCS utilized available local materials and low costs but provided a good return on investment.

Short-lived horticultural plants such as kale, spinach, chili, tomatoes, and others are very suitable to be applied to pond swamps during flooding season with the advantages of fast harvest, rapid return on capital, and relatively small land needs. These types of vegetable are always needed by every household as popular vegetable in the community.

Kale is a nutrient-rich green leafy vegetable grown in conventional agricultural systems. In addition to having a high economic value, the vegetable is also rich in nutrition. The nutritional contents contained in kale includes Protein, Calories, Carbohydrates, Fat, Vitamin A, Vitamin C, Vitamin B-6, Vitamin K, Calcium, and Magnesium. This vegetable can also prevent various diseases such as diabetes and cancer

and reduce the risk of stroke (Adimihardja et al. 2013).

In addition to its fast harvesting ability, a regular challenge experienced in growing horticulture is products that can quickly break down that can achieve a post-harvest loss of 30 to 70%. However, by doing good cultivation techniques this problem can be overcome (Ng'atigwa et al. 2020).

Research on the cultivation of pak choi plants by using floating method resulted in a fresh weight of 164 g/plant, and the number of plants worth selling was as much as 70% (Harun et al. 2022).

The habit of the community, especially housewives who grow horticulture in the yard, is a positive thing to do. In addition to fulfilling the adequacy of family nutrition of vitamins, it can also increase family income if it is used for sale when the harvest exceeds household consumption

Srimulya Village, located in Sematang Borang District, Palembang City, is one of the areas that have many swamps. In the dry season, thiese swamps tend to be dry and can be planted with various types of horticulture, such as spinach, kale, chili, and others. However, at inundated time, they are not suitable to grow crops so that the land use becomes unproductive.

This research aims to determine the feasibility of horticulture cultivation efforts with floating methods on swampland. The location of research is the swampland in Srimulya Village, Sematang Borang District of Palembang.

RESEARCH METHOD

The location of the research was determined deliberately (purposive) in Srimulya Village, Sematang Borang Subdistrict, Palembang City, South Sumatra Province with the consideration that in this area there are many swamps. This study was conducted during the flooding season from January to June 2021. The type of cultivated horticulture was Kale. The respondents were 40 people taken using Simple Random Sampling Method. The data used in this study were primary data and secondary data. Primary data were obtained from observations in the field and direct interviews of respondents by filling out questionnaires, while secondary data were obtained from libraries, official sources from relevant agencies, as well as other sources related to this research.

The method used in determining economic feasibility was business feasibility analysis using R/C and B/C Ratio. Benefit Cost Ratio or B/C Ratio is a term related to the calculation of profits. This calculation is to find out whether a business is profitable or detrimental. B/C Ratio is a measure of the ratio between revenue and Total Production Costs of a business. Where "B" is the benefit, while "C" is the cost. The results of the B/C Ratio calculation will show how much profit is obtained from the total costs incurred from a business. If the result of the calculation is more than 1, then the business is profitable and worth continuing. If the calculation result is less than 1, then the effort is not profitable and needs to be reviewed. Indicators that can show the amount of profit of a business project include:

If the B/C ratio is more than 1, then the profit from the project is greater than the expenditure so that the project is acceptable or worth continuing.

If the B/C ratio is less than 1, the profit from the project is less than the expenditure so that the project is not feasible and needs to be reviewed.

If the B/C ratio is equal to 1, the profit and expenditure are said to be balanced or breakeven.

Revenue Cost Ratio (R/C Ratio) is a measure that shows how much it costs to generate revenue. This ratio is calculated by dividing total costs by total revenue. Revenue Cost Ratio or the ratio of revenue to cost is one of the ratios used to measure

the efficiency of costs incurred against income obtained. The use of the R/C ratio is known to aim to determine the extent of the results obtained from profitable businesses in a certain period.

R/C Ratio Formula

R/C ratio = Revenue: Total Cost (Fixed Cost + Variable Cost)

if R/C > 1 then the business is declared profitable, and if R/C < 1 then the business is declared a loss.

The total cost is calculated by summing a fixed cost (FC) with variable cost (VC) using the formula: TC = FC + VC. Revenue is the difference between receipt (TR) and total cost (TC) and is expressed using the formula: Pd = TR - TC, while calculation R / C by comparing receipts with total costs, expressed using the formula: Total Receipt R/C Total Cost.

RESULT AND DISCUSSION

This study took place in Srimulya Village, Sematang Borang Subdistrict, Palembang City. The area of Palembang City is 400.61 km^2, Kec. Sematang Borang 36.98 km^2, with an altitude of 7 mdpl. Srimulya Village is an area of 8.13 km^2 (BPS Kota Palembang 2021).

This location is one of the swamp areas that cannot be used during the rainy season, which is around January to June. People's incomes at the research site are still low, with 65% of households being percentile 1 or the lowest 10% income (BDT.TNP2K 2021).

Economic activity in the Sematang Borang Subdistrict is dominated by the construction and trade services sector. As many as 35% of working individuals are engaged in construction services as manual laborers, and 18% of them are in the trade sector. Horticulture farming activities are carried out by housewives in spending their lesisure time. Horticultural commodity that they cultivate is a type of root kale.

The data were obtained through interviews with 40 respondents consisting of housewives and described into several groups based on age, education, and the number of family dependents. The classification of respondents in this study aims to know the characteristics of respondents as research subjects. Age is one of the factors affecting work productivity. The age of 15 years to 65 years is considered productive, but the age range of 18 years or lower in which an individual is still at school age is not included in the labor force. At the age of over 65 years, an individual is at an unproductive age anymore because physical ability has decreased. Article 1 paragraphs 1 and 2 of Law No. 13 on Employment mentions that the age level can also affect an individual's response to certain things for example the absorption of information, innovation, and technology (Kemenperin 2003).

Table 1. Respondent's age distribution of sampling

Age of respondents (years)	Number (people)	Percentage (%)
25 – 34	4	10
35 – 44	16	40
45 – 54	13	32.5
55 – 64	7	17.5
> 64	2	5
Sum	40	100

Source: Primary Data (Processed), 2021

The result shows that the ages of respondents ranged from 25 to 65 years old with the distribution of respondents' ages can be seen in Table 1. On Table 1, it is seen that respondents are mostly productive aged in the age range of 25 to 64 (95%) only 2 people over the age of 64 years (unproductive) or 5% of the total respondents. The concept of Productive Age Population in this study refers to the Central Statistics Agency (BPS). Productive age according to BPS is the population in the age range of 15-64 years (Goma et al. 2021).

Table 2. Distribution of respondents' education levels

Level of Education	Number (people)	Percentage (%)
Not finishing elementary school	2	5
Primary school	12	30
Junior high school	18	45
Senior high school	7	17.5
Bachelor	1	2.5
Sum	40	100

Source: Primary data (Processed), 2021

Based on the level of education, most respondents are graduates of Junior High School (45%) and the least are Bachelor of S1 (2.5%) (Table 2). Education can affect the success of farming businesses. Farmers who are highly educated, more experienced, and better trained will be better in carrying out their business and often become members of organizations oriented to progress in agriculture. They are also receptive to new technologies that will be applied in their farming. Poorly educated farmers will find it difficult to absorb technological developments, making it difficult and taking a long time to adopt new things. (Schreinemachers et al. 2016).

Family dependents are people who have family relationships or do not have family relationships and live in one house, and the cost of life is charged to the head of the family because he has not worked. (Purwanto and Taftazani 2018).

Table 3. Distribution of respondents' family dependent rates

Family Dependents	Number (people)	Percentage (%)
1 – 3	10	25
4 – 6	28	70
7 – 9	2	5
Sum	40	100

Source: Primary data (Processed), 2021

The number of family dependents also has a role in the farming business run by kale farmers in Srimulya Village (Table 3). Partially, education and the number of dependents have a positive and significant effect on income (Dewi and Dewi 2018).

Table 4. Cost of making 1 unit of floating raft

Material	Number	Unit	Price (Rp)	Total
Large bamboo	2	Meter	20.000	40.000
Small bamboo	8	Meter	10.000	80.000
Used plastic bottles	300	Unit	100	30.000
Plastic rope	0.5	Roll	14.000	7.000
Workforce	1	Person	20.000	20.000
Total manufacturing price of 1 raft.				177.000

Source: Primary Data (Processed), 2021

The land area used in this research is 600m^2. Floating kale cutivation is carried out on a raft measuring 2x4 meters, and each raft can accommodate 80 polybags. In this area, rafts as many as 75 units can be used, but to facilitate mobility and process, 60 rafts only are enough (Table 4).

At the time of plant care and harvest, sufficient space is needed for the movement of the rafts, making it easier for farmers to adjust the position of the raft.

Table 5. Production cost per cycle

Material	Cost (Rp)	Description
Raft depreciation expense	885.000	Fix cost
Polybag Purchase	960.000	Variable cost
Seedling purchase	540.000	Variable cost
Cost of planting media	800.000	Variable cost
Cost of Workforce	500.000	Variable cost
Cost of fertilizer, etc.	705000	Variable cost
Total Cost	4.390.000	

Source: Primary Data (Processed), 2021

Floating kale cultivation requires several costs that are divided into fixed costs and variable costs. Fixed cost is a relatively fixed cost and is not affected by the amount of production. Thus, if production decreases or increases, the cost incurred is fixed. Variable costs are costs that will fluctuate in proportion to the amount of production. The total cost of making a floating raft is Rp 177.000,-. It costs Rp 10.620.000,- for 60 floating rafts. Depreciation costs that must be incurred each planting cycle are Rp 885.000.- The fixed cost element of this farm is only from floating rafts, while variable costs consist of the cost of purchasing polybags, seed purchase costs, planting media, labor, fertilizer, and others. The total production cost incurred is Rp 4,390,000,- (Table 5).

Table 6. Recapitulation

Recapitulation	Value
Total Cost of Production (C)	4.390.000
Revenue (R)	14.000.000
Benefit (B)	9.610.000
R/C Ratio	3.19
B/C Ratio	2.19

Recapitulation of the cost and feasibility of farming with floating systems can be seen in Table 6. Revenue obtained in one production is Rp. 14,000,000, - while the income is Rp. 9,610.00,-

CONCLUSION

Empowering the community to cultivate land when inundated through a floating agricultural system can increase people's income. FCS uses in the research site show evidence that kale can grow well. They are suitable for consumption. Farmers can plant kale six times a month. FCS can increase family income during the flooding season. An acceptance of Revenue / Cost Ratio is 3.19 indicating that for every Rp 1,00 the cost incurred is Rp. 3,19,00. The Benefit / Cost Ratio is 2.19 indicating that for every Rp 1,00 the costs incurred will provide a profit of Rp. 2.19,00

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