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Analysis of the Floating Net Cage Business for Tilapia (*Oreochromis niloticus*) at Lake Maninjau Nagari Tanjung Sani, Tanjung Raya District, West Sumatra Province

Analisis Usaha Keramba Jaring Apung Ikan Nila (Oreochromis niloticus) di Danau Maninjau Nagari Tanjung Sani Kecamatan Tanjung Raya, Provinsi Sumatra Barat

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Abstract

Lake Maninjau has been developed with the floating net cage (KJA) system for aquaculture. In 2020, the number of KJA decreased by 0,03%, but in 2021, the number of KJA increased by 9,5%; this shows that the cultivator community still maintains the tilapia KJA business. This situation makes the author want to know the investment amount, income, and business. This situation makes the author want to know the investment amount, income, and business feasibility. The method used was a survey, while the respondents were determined deliberately on five KJA cultivators with ten bags and five KJA cultivators with 20 bags. The results showed that the KJA with ten bags had an investment of IDR 626,864,000, an IDR 825,600,000/year income, and an IDR 227,346,334/ year profit. Meanwhile, KJA has 20 bag units, an investment of IDR 1,276,100,000, an income of IDR 1,684,800,000/year, and IDR 490,695,668/ year. Based on the analysis results, the investment criteria were obtained for KJA with 10 RCR bag units (1.38), FRR (36.26), PPC (2.76) and for KJA with 20 RCR bag units (1.41), FRR (38, 45), PPC (2.60). The calculation of the RCR is more than 1, the FRR is greater than the BRI bank interest rate of 6.4%, the PPC is less than the maximum time required, and the economic life of the equipment used for the tilapia KJA business is two years and seven months, then the KJA fish business tilapia worth to run.

Keywords: Feasibility, Floating Net Cages, Tilapia.

Abstrak

Danau Maninjau telah dikembangkan untuk usaha budidaya perikanan dengan sistem Keramba Jaring Apung (KJA). Pada tahun 2020 jumlah KJA mengalami penurunan sebesar 0,03%, tetapi pada tahun 2021 jumlah KJA meningkat sebesar 9,5%, ini menunjukan usaha KJA ikan nila tetap dipertahankan oleh masyarakat pembudidaya. Keadaan ini membuat penulis ingin mengetahui besarnya investasi, pendapatan, dan kelayakan usaha. Metode yang digunakan adalah survei, sedangkan penentuan responden ditentukan dengan sengaja terhadap 5 orang pembudidaya KJA dengan jumlah unit 10 kantong dan 5 orang pembudidaya KJA dengan jumlah unit 20 kantong. Hasil penelitian menunjukkan KJA dengan unit 10 kantong, investasi sebesar Rp626.864.000, pendapatan Rp 825.600.000/tahun, dan keuntungan Rp 227.346.334/tahun. Sedangkan KJA dengan unit 20 kantong, investasi sebesar Rp 1.276.100.000, pendapatan Rp 1.684.800.000/tahun, keuntungan Rp 490.695.668/tahun. Berdasarkan hasil analisis kriteria investasi didapatkan untuk KJA dengan unit

10 kantong RCR (1,38), FRR (36,26), PPC (2,76) dan untuk KJA dengan unit 20 kantong RCR (1,41), FRR (38,45), PPC (2,60). Perhitungan RCR lebih dari 1, FRR lebih besar dari suku bunga bank BRI sebesar 6,4%, dan PPC lebih kecil dari waktu maksimum yang disyaratkan dan umur ekonomis peralatan yang digunakan untuk usaha KJA ikan nila adalah 2 tahun 7 bulan, maka usaha KJA ikan nila layak untuk dijalankan.

Kata kunci: Kelayakan, Keramba Jaring Apung, Ikan Nila

1. Introduction

Maninjau Lake is a natural lake categorized as a volcanic lake located in Agam Regency, West Sumatra Province. The water surface area of Maninjau Lake is about 99.5 km^2 (Martia & Taufik, 2012). With this area, the lake is undoubtedly used for various purposes such as a source of drinking water, as a hydroelectric power plant (PLTA), as a means of transportation and as a tourism area as well as a fish catching area and a place for aquaculture in the form of floating nets (Merina et al., 2014). Maninjau Lake is located in Agam Regency, precisely in Tanjung Mutiara District. Administratively, Tanjung Mutiara District consists of eight Nagari, one of which is Nagari Tanjung Sani.

The development of floating net cage every year, namely in 2019, the number of KJA in Lake Maninjau reached 17,569 plots. In 2020, the number of KJA was 17,417 plots. A decrease in KJA in 2019 and 2020 occurred due to the dismantling of damaged and no longer functioning cages, with a reduction of 0.03% (DKP Agam, 2020). In 2021, the number of KJAs in Lake Maninjau increased by 9.5%, totalling 19,084 KJAs. In 2020, the number of KJA in Nagari Tanjung Sani was 4,062; in 2021, KJA increased to 4,468 KJA. KJA businesses are found in various regions, one of the largest of which is Nagari Tanjung Sani.

KJA in Nagari Tanjung Sani has a variety of bag sizes, but the most developed is the 5x5x5 m^3 KJA, with ten bags and 20 bags. Cages of this size are often used for tilapia cultivation because they have a size sufficient to accommodate tilapia optimally, can optimize the use of space and water in the cultivation area, and can increase operational efficiency and productivity. This site is also considered ideal for maximizing tilapia production and minimizing the risk of tilapia death. This phenomenon began in 1997, so mass mortality recurs continuously. Another cause of mass mortality is pollution due to uncontrolled growth in KJA (Billova & Mubarak, 2020).

Based on these conditions, the author wants to know the amount of investment, income, profit, and also the feasibility of tilapia floating net cages in Lake Maninjau Nagari Tanjung Sani, Tanjung Raya District, Agam Regency, West Sumatra Province. A floating net cage is a means of raising fish such as tilapia or other aquatic biotas whose framework is made of bamboo, wood, paralon pipes or square-shaped iron, which is given a net and a float such as a plastic drum or styrofoam so that the container remains floating in the water (Sambu & Amir, 2017). This study aims to analyze the amount of investment, income, and feasibility of tilapia (*Oreochromis niloticus*) floating net cages size (5x5x5 m^3) with ten bags and 20 bags in Lake Maninjau.

2. Material and Method

2.1. Time and Place

This research was conducted in September 2022 at Nagari Tanjung Sani Lake Maninjau.

2.2. Methods

This location, the center of KJA production in Lake Maninjau, was deliberately selected. The method used is the survey method. Groves et al. (2011) explain that survey research uses samples from one population and questionnaires as the primary data collection tool, and the respondents interviewed are cultivators. This analysis was carried out on two categories of KJA businesses, for category I (5 respondents who had 10 KJA bags) and for category II (5 respondents who had 20 KJA bags) with the consideration that the respondent's criteria were homogeneous, and could be seen from the cultivator's experience of approximately five years and the same KJA size (Hendrik, 2014; Afif, 2015, Nainggolan, 2018).

2.3. Data Analysis

Data analysis is used for investment with the formula (I = MT + MK), income and profit with the formula (TR = P x Q), and business feasibility with ((RCR = TR / TC), (FRR = x 100%), (PPC = x period)).

Description:

I	= Investment	JI	= Profit (net income) (IDR)
MT	= Fixed capital	TC	= Total cost (IDR)

MK = Working capital
TR = Total revenue (IDR)
P = price of fish produced (IDR/kg)
Q = Production of fish produced (kg)
PPC = Payback period of capital
RCR = revenue cost of ratio
n = Profit
TI = Total investment
FRR = Financial rate of return
Periode = Production time

Business feasibility criteria, namely: Revenue Cost of Ratio (RCR). R/C > 1, then the business is profitable and worth continuing; R/C < 1, then the business is losing money and not worth continuing; R/C = 1, then the business breaks even.

Financial Rate of Return (FRR). FRR > The prevailing bank deposit rate, then the business provides a return on the investment invested, then the business is feasible to continue. Investment, then the business is worth continuing; FRR < The prevailing bank deposit rate, then the business should be deposited with the bank, then the business is not viable.

Payback Period of Capital (PPC). Decision criteria: If the value of the payback period is> economic life, then the investment is rejected. Suppose the value of the payback period < economic life, then the investment is accepted. So, the assessment criteria in this payback period method are if the payback period is smaller than the maximum required time, the project is received, and vice versa. If the payback period is greater or longer than the required time, the investment is rejected.

3. Result and Discussion

3.1. Investment

The investment calculation for tilapia floating net cage businesses includes fixed and working capital. The KJA manufacturing business consists of capital for the purchase of U iron, nets (Cages), fine nets, 50 cm nets, plastic drums, ropes and anchors, colts, boards and broth, paint, net weights, ropes, ladders, rafts, and labor wages, as can be seen in Table 1.

Table 1. Average fixed capital procurement of tilapia KJA business in Nagari Tanjung Sani

No	Component	10 bags category		Total (IDR)	20 bags category		Total (IDR)
		Unit	Unit price (IDR)		Unit	Unit price (IDR)	
1	U Iron	61	150.000	9.150.000	114	150.000	17.100.000
2	Net (Cage)	10	1.500.000	15.000.000	20	1.500.000	30.000.000
3	Fine Netting	3	450.000	1.350.000	6	450.000	2.700.000
4	50 cm Net	8	80.000	560.000	14	80.000	1.120.000
5	Plastic Drum	50	250.000	12.5000.00	98	250.000	24.500.000
6	Rope and Anchor	10	350.000	3.500.000	20	350.000	7.000.000
7	Bolts	6	180.000	1.080.000	12	180.000	2.160.000
8	Board and Broti	10	60.000	600.000	20	60.000	1.200.000
9	Cat	5	100.000	500.000	10	100.000	1.000.000
10	Net Weights	40	5.000	200.000	80	5.000	400.000
11	Rope	8	40.000	320.000	16	40.000	640.000
12	Dike	2	50.000	100.000	4	50.000	200.000
13	Raft	1	1.000.000	1.000.000	1	1.000.000	1.000.000
14	Wages for making KJA		3.000.000	3.000.000		6.000.000	6.000.000
Fixed capital (IDR)				36.360.000	Fixed capital (IDR)		95.020.000

It can be seen in Table 1 that the fixed capital for ten bags of KJA amounts to IDR36,360,000, and for 20 bags of KJA, it has a fixed capital of IDR 95.020.000. Working capital spent by tilapia KJA farmers consists of tilapia seeds, grower starter feed, grower feed, labor costs, and medicines, as shown in Table 2.

Table 2. Working capital for KJA business in Nagari Tanjung Sani

No	Cost component	Physical quantity (Units)		Units	Working capital (IDR)	
		Category I	Category II		Category I	Category II
1	Tilapia fish seeds	100.000	200.000	Fish	30.000.000	60.000.000
2	Starter feed	5200	10.400	kg	52.000.000	104.000.000
3	Grower feed	20.800	41.600	kg	205.902.000	411.840.000
4	Labor	10	20	Pockets	7.350.000	14.700.000
Working capital					295.252.000	590.540.000

Table 2 shows that the working capital in the 10-bag KJA business amounted to IDR 295.252.000, and the 20-bag KJA business amounted to IDR 590.540.000. Thus, the total investment for the 10-bag KJA business amounted to IDR 331.612.000; for the 20-bag KJA business, it had a total investment of IDR 685.560.000.

3.2. Revenue and Profit

The income from 10 KJA bags averaged 17,200 kg/harvest, and the price of tilapia was IDR 24,000, so the income obtained from 10 KJA bags amounted to IDR 412,800,000 / harvest. The income of 20 KJA bags is 35,100 kg/harvest, so the income obtained by 20 KJA bags is IDR 824,400,000 / harvest. Fixed costs of cultivators consist of depreciation costs and maintenance costs; for ten bags of KJA, depreciation costs amounted to IDR6,249,666 /harvest and maintenance costs of IDR1,550,000/year, so the total fixed costs of 10 bags of KJA were IDR7,779,666/year. Furthermore, for 20 bags of KJA, depreciation costs amounted to IDR10,024,332 / year, and for maintenance costs as much as IDR3,050,000/year; thus, the total fixed costs for 20 bags of KJA business amounted to IDR13,074,332 / year.

Non-fixed costs are the same as working capital. Non-fixed costs in this tilapia floating net cage are expenses calculated annually that can change in value according to each cost component's physical amount and price conditions, such as tilapia seeds, starter feed, grower feed and labor. Ten bags of KJA tilapia seeds amounted to 100,000 fish for IDR300/fish, 5,200 kg of starter feed at 10,000/kg, 20,800 kg of grower feed for IDR 9,900/kg, and labor wages of IDR 7,350,000. Meanwhile, for 20 bags of KJA, tilapia seeds amounted to 200,000 fish, starter feeds 10,400 kg, grower feeds 41,600 kg, and labor costs IDR 14,700,000. Profit is income divided by total costs, while the profit of 10 KJA bags is IDR 109,798,334 / harvest with a total income of IDR 412,800,000/harvest and total costs incurred IDR 303,031,666/harvest. While the profit of 20 KJA bags is IDR 238,785,668/harvest, income is IDR 824,400,000/harvest and total costs amount to IDR 603,614,332.

3.3. Business Feasibility

In this tilapia farming business, a business feasibility analysis is carried out to determine the value of the Revenue Cost of Ratio (RCR), the value of the Financial Rate of Return (FRR), and the value of the Payback Period of Capital (PPC), which can be seen in Table 3.

Table 3. Working capital of KJA business in Nagari Tanjung Sani

Business analysis	Cage Size (5x5m)	
	10 bags	20 bags
Total investment (IDR)	331.612.000	685.560.000
Total income (IDR)	412.800.000	825.600.000
Total cost (IDR)	303.0021.666	603.614.332
Profit (IDR)	109.798.334	238.785.668
RCR	1,36	1,40
FRR (%)	33,10	34,83
PPC	3,02	2,87

The results of this RCR indicate that this tilapia farming business is profitable; if RCR> 1, then the company is profitable and worth continuing. In line with previous research conducted by Mayasari (2017), her research showed that each cultivator obtained an RCR value> 1, which means that the tilapia KJA business is feasible.

The results of the FRR calculation in this tilapia KJA cultivation business for the size of 10 bags amounted to 33.10%. For the size of 20 bags of tilapia, KJA amounted to 34.83%, where the FRR value for both bag categories is greater than the interest rate at Bank Rakyat Indonesia (BRI) of 6.4%, which means that the business is worth investing in. This is in line with research conducted by Toariaunaldi et al. (2017), which states that if the FRR value> bank deposit interest rates, then the investment should be made in the business, and if the FRR < bank interest rates, then the investment should be saved in the bank because it is more profitable. This shows that the FRR value of the tilapia KJA business size of 10 bags and 20 bags is greater than the prevailing interest rate at the bank.

The PPC value obtained for the 10-bag tilapia KJA business is 3.02, which means that this tilapia KJA business can return investment capital when the business has been running for about one year and six months, while for the 20-bag tilapia KJA business is 2.87, which means that this tilapia KJA business can return investment capital when the business has been running for about one year and two months, with the economic life of the fixed capital component is ten years. In line with previous research conducted by Nainggolan (2018), Investment is rejected if the value of the payback period>economic age. If the value of the payback period < economic age, then the Investment is accepted. So, the assessment criteria in this payback period method are if the payback period is less than the maximum time required, the project is received, and vice versa. The Investment is rejected if the payback period is more significant or longer than necessary. While the economic life of the equipment used for tilapia farming is ten years, the 10-bag size tilapia KJA is feasible to run, and the 20-bag size tilapia KJA is feasible to run.

4. Conclusions

Based on the results of the study, the conclusions that can be drawn are as follows: Investment for tilapia KJA business with ten bags amounted to IDR 639,364,000, and tilapia KJA business with 20 bags amounted to IDR

685,560,000. The profit of cultivators every harvest for KJA 10 bag IDR 109,798,334, and KJA 20 bags amounted to IDR 238,785,668. The results of the calculation of investment criteria obtained for KJA 10 bags with a value of RCR (1.36), FRR (33.10%), PPC (3.02) while for the 20 bags obtained a value of RCR (1.40), FRR (34.83%), PPC (2.87). From the three investment criteria calculated, the tilapia KJA business in Nagari Tanjung Sani is feasible to develop.

5. Suggestions

Tilapia KJA cultivators must pay attention to a good feeding system by paying attention to the following things, namely, paying attention to the time of feeding by giving feed when the fish are active and hungry, such as in the morning and evening, paying attention to the amount of feed, giving enough feed, not too much so as not to cause the rest of the feed to settle. The last is how to feed; consider the flow of water and wind when giving a feed; do not immediately throw feed in one place, but spread it evenly.

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